THE BULLETIN

NOVEMBER

1936

—

VOLUME 4

—

NUMBER 4

—

CONVENTION REPORT

OF THE NATIONAL ASSOCIATION

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Bulletin of the National Association of Nurse Anesthetists

VOLUME 4, NO. 4 NOVEMBER, 1936

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REPORT OF FOURTH ANNUAL MEETING

NATIONAL ASSOCIATION OF NURSE ANESTHETISTS

HELD IN CLEVELAND, OHIO

SEPTEMBER 29th and 30th and OCTOBER 1st, 1936

in conjunction with the

AMERICAN HOSPITAL ASSOCIATION

ADDRESS OF WELCOME

AGATHA C. HODGINS, Honorary President
National Association of Nurse Anesthetists

A fortunate choice made Cleveland, in this its gala centennial year, the place of your convention meeting. Perhaps never in its history has the city been the center of such wide interests, such diversified important gatherings. The very air is charged with the thrill of continuing excitement; its streets, resplendent with color, are filled with happy, interested visitors.

In the present momentous political situation Cleveland has played an important part, being host first to the great Republican Convention and later to other and different political groups. In fact, a prominent eastern newspaper commented in an editorial that "Cleveland in 1936 has been a political habit."

To this atmosphere, brimming with interest, the American Legion, with its colorful pageantry, lent further life and gayety.

As a diverting accompaniment to these important activities, we have the "Great Lakes Exposition," an unique show place which, set amid surroundings of beauty and depicting with significance and charm the cultural life of all nationalities, affords relaxation, interest and amusement to visitors; the most distinguished of whom was the President of the United States.

It is fitting then that the culmination of this red-letter summer should be the conventions of different branches of a great profession—a profession whose concern is the conservation and perpetuation of that most priceless of all human possessions—health; without which neither the symbolized wisdom of the first group, the courage of the second nor the diversified useful and artistic pursuits of the composite third would be possible.

While Moses Cleaveland, as a perfect host, gives equal warmth of greeting to all, he has for your group an especial welcome and in your achievements a particular pride. An especial welcome because your members typify the pioneer spirit in opening up, under often discouraging and

difficult circumstances, a new field of work for women—a particular pride because this adventure took tangible, permanent form, here in Cleveland, as the "National Association of Nurse Anesthetists."

To the convention of this Association we now extend a cordial welcome from the city of Cleveland, and also happily renew the friendly greetings, already given, from the University Hospitals where your organization meeting was held. The Ohio State Association of Nurse Anesthetists are proud and happy to have you as their guests, and together with Headquarters and the Cleveland Committee have exerted every effort to make your visit pleasant and profitable.

Among the speakers on your program are men distinguished in their field—one of whom we are all proud to claim as an old and staunch friend. The different hospitals have arranged interesting clinics for your benefit. The banquet will bring to you, through the speaker of the evening, some of the allure and fascination of another adventure in a primitive land. On the lighter side, the Exposition beckons you for amusement and diversion. The beauty spots of the city for your esthetic enjoyment; a fashion show for the vain — and what woman is not? Interpenetrating these serious and diverting occupations runs the warmth of our welcome to you. We hope that every moment of your time will be filled with pleasantness, and recollection bring you happy memories of this Cleveland Convention.

May you take from this surcharged atmosphere some of its symbolized wisdom, courage, artistry and gayety, which, re-expressed by you, as you go your different ways, will create an ever-widening circle of friendship for the profession to which you have the honor to belong.

GREETINGS

GEORGE W. CRILE, M.D.
Cleveland, Ohio

It is a very great pleasure for me to be on this platform for a moment and a great responsibility for me to be the only man present, and I am glad indeed to offer a word of greeting, to add to those of Miss Hodgins. In addition I would like to express in a few words what I think is the significance of this movement.

First of all, I would like to state a fact that you probably do not know —one that Miss Hodgins has probably forgotten if she has realized it —and that is how ill adapted an intern anesthetist was, and nearly all surgeons have arrived at this same conclusion. The intern was interested in his career—anesthesia was not his primary interest. But there are other reasons why the intern is not the ideal anesthetist. I do not think a man can ever have the finesse in the administration of an anesthetic that a woman has. Having reached that conclusion, I could see no other way out of the difficulty but to look about and consider all the nurses I knew and to choose from among those one who had the ideal qualities to undertake a great responsibility. The nurse whom I selected had a very interesting personality, which has be-

come even more so as time has gone on. I recognized in her the person who should be asked to take this responsibility. I asked her one day if she would undertake it and I remember very well one thing she told me—and I caught her meaning very well indeed. She thought it over and said she would take it provided I would understand that whatever occurred, she was doing her best. I knew then I was not to find fault or scold. As a matter of fact, she need not have told me that because there never was a moment in all the episodes in our early experience when I had any occasion to be disappointed in her work for even a moment. I suppose it surprises you to know how this movement started. We went up to the laboratory and gave anesthetics to animals; saw the good effects, the bad effects; the later effects. Thus Miss Hodgins started at the beginning and found her way up. Most of you here recognize the contribution made by Miss Hodgins and her school but in addition to that, Miss Hodgins was an inventive sort of person and made many suggestions which were adopted by the Ohio Chemical Company for the modification of their old gas machine.

Now, for myself and for the surgical profession, and for the hospitals and for the patients, I should like to say a word regarding what this movement means. I can illustrate this no better than by citing the finesse of Miss Adams in dealing with a little patient two or three years old who had an exophthalmic goiter, and was a very desperate risk. Miss Adams took two or three weeks' time to become acquainted with that little child, to play with the child, give it toys and have it understand the gas machine until finally she had the child's complete confidence and was able to give it the anesthetic without any struggle on the part of the child. That is symbolic of what I meant when I referred to the finesse of the nurse anesthetist as compared with that of the intern. It represents a contribution that I do not believe can ever be equalled among doctors.

I think this movement is one of the most beneficent movements we have seen in the whole field of operative surgery. But as with most beneficent movements you are by no means through with your task. You have much more to do, and I notice by your program that you are doing it. You are perfecting your technique and understanding and along with that goes a progressive improvement in your results.

Now, I must not take more of your time but I would like to make one more point. If it had happened that the nurse anesthetist had accidents that could have been avoided, if the nurse anesthetist had not been steadfast in the midst of trouble, if she would not stay at her post in times of great crisis or if she could not be depended upon, that would have been an entirely different matter. But the feeling by the nurse anesthetist of devotion to the welfare of the patients and the safety of those under her care has never been approached by the other type of anesthetist. Goodness knows, as compared with the intern anesthetist, there isn't any comparison at all. It is the difference between a blacksmith and an artist.

I am basing what I have said upon a definite set of facts, for the group of anesthetists who went through Miss Hodgins' school have a report, if I remember the figures correctly, of an anesthetic mortality that is the lowest that has ever been reported by any hospital or association heretofore

—a mortality rate of something like one in forty thousand.

This feeling which I have toward you and your work is a feeling that is growing more and more in the principal surgical centers of this country. It is very interesting to remember that if the great War had gone on another year, the British army would have adopted the nurse anesthetists right in the middle of the war. Some of our nurse anesthetists served in the American Army and it is a tribute to them that even under all the difficulties of war surgery, the nurse anesthetist made for herself a lasting place.

I only wish to add to my own the greetings of the medical profession of the city of Cleveland and of the hospital staffs, and if there is anything we can do or if there is anything you wish to see, I hope you will let us know. I will close by expressing my deep appreciation for your fine service.

PRESIDENT'S ADDRESS

HILDA R. SALOMON

Jewish Hospital, Philadelphia, Pa.

The National Association of Nurse Anesthetists extends to you a warm welcome to our fourth annual meeting, and we especially greet those members who are attending for the first time. The success of any convention lies largely in the number of people who concern themselves actively with the meetings of the Association. May your visit here be profitable, instructive and inspiring.

We, as an Association, are just entering that period of childhood when one learns to obey—the period of habit formation. Good habits develop into good and definite action and as we acquire the best in this, our formative period, so shall we develop into an organization of value and authority in our chosen profession. Naturally we must grow slowly if we desire to grow surely. With the same vision and foresight of my distinguished predecessors, whose patient, self-sacrificing labors have laid the sound foundation of the National Association of Nurse Anesthetists, we must continue to build. The superstructure must be worthy of their efforts and a fitting heritage to hand on to our successors.

Our organization will, at times, suffer the fate of those who would take their place in the van of any new movement. But we must not become discouraged. There have been occasions when it has appeared to some of you that the functions of our group were in conflict with others. Part of our task must be to demonstrate that we are all of one body dedicated to the interests of humanity—a coordinating, cooperative group that depends entirely upon the strength, loyalty and sense of appreciation possessed by our individual members.

One of the most vital factors in the upbuilding and expansion of our work as anesthetists is that we continue to give to the hospitals the service which will command respect and cooperation. We are today hearing many new ideas regarding the nurse anesthetist and it is now that we must see clearly and build wisely if our work is to

stand in the future. If we have faith in our work and in the value of our service to the hospital, we shall not fail.

And now, as time marches on, what better thought can I leave with you than the words Robert Louis Stevenson used to describe the character of his physician:". . . .*Generosity*, such as is possible to those who practice an art; *discretion*, tested by a hundred secrets; *tact*, tried by a thousand embarrassments; *cheerfulness* and *courage*."

The following reports were submitted and approved:

PRESIDENT'S REPORT

One year ago when I was honored by being elected your President, little did I realize the tremendous task that confronted me, and had it not been for the kindness of the officers of this Association, the members of our various committees and the cooperation of the members as a whole it would have been impossible for us to have made the progress we have during the past year. My sincere thanks to you.

At our first convention, held in Milwaukee September, 1933, our Honorary President and organizer, Miss Agatha C. Hodgins, in her address made the following remark: "This meeting is the first fruit of what might be called an adventure, and any adventure may become a satisfactory achievement, a disastrous occurrence or perchance dwindle to a mere excursion."

In reviewing the growth of our organization during the past four years surely no one could refer to it as either a disastrous occurrence or an excursion. The planting of our National Association of Nurse Anesthetists' tree on June 17th, 1931, can certainly be considered a satisfactory achievement when in only four years our membership has grown from 49 to 1110 members, and further encouragement was given us this year in the addition of a life member—Mrs. Mary A. Ware, Children's Hospital, Cincinnati, Ohio. May we be able to report many more in the near future. With the increasing membership you can easily visualize the volume of work handled by the Membership Committee. This committee has been ever faithful to its duties.

Fourteen States have organized and are affiliated with our National body. We welcome the following State organizations that were accepted during the past year, and we extend to them our wholehearted cooperation: Texas, Oregon, Mississippi, Tennessee and Nebraska. We are hoping that during the coming year more State groups will realize the value of organization and affiliation with the National Association, and we assure them of assistance from headquarters.

Little do we realize or appreciate the amount of work at headquarters, and the faithful service rendered by our Executive Secretary, Mary Lucile Goodman, during the past year cannot be overlooked.

You have derived much pleasure and valuable information from the Bulletin. In conjunction with her arduous duties in the clinic, Mrs. Fife, Chairman, and her committee, have been entirely responsible for whatever pleasure and benefit you have derived from this splendid publication. Will you not

then materially express your appreciation of their efforts by contributing articles from time to time on some interesting phases of your work, bearing in mind that we learn by the experiences of others.

Two of the most important committees are the Educational and Public Relations. One of the objects of our organization is to raise and maintain the educational standards of our profession; consequently Miss Lamb and her committee during the past two years have been untiring in their efforts to prepare a suggested standard curriculum for Schools of Anesthesia. This has been no simple task and we anticipate that at the conclusion of this convention the standard outline will be completed and accepted and that within the near future a list of schools will be published.

And now for the activities of the Public Relations Committee. Although there have been several occasions when we were much concerned about legislative proceedings in a few states, we are happy to make the following announcements, which to us are most gratifying: First, the Supreme Court of California rendered its decision in favor of the nurse anesthetist. Second, the Civil Service Commission of New York requested and obtained questions from us for the examination of nurse anesthetists. Third, at the Pennsylvania Anesthetists' convention held in Pittsburgh in May, where your President was a guest, several prominent men in authority gave assurance that should anything develop in the way of legislative proceedings, our Association would receive ample protection and cooperation. Fourth, the American College of Surgeons will hold its convention in Philadelphia next month, at which time the Hospital Standardization Conference has asked your President to take the assignment on "Anesthesia." All of the above-mentioned recognition is most encouraging.

Last year under the able leadership of our Vice-President, Miss Rice, the Revisions Committee spent unlimited time in revising the Code of Regulations. It has therefore not been necessary for that committee to recommend any alterations this year. However, at this meeting some definite action should be considered regarding the acceptance of male anesthetists as members in the Association. Our Code of Regulations as it stands today does not cover this subject satisfactorily. A definite stand on this matter will clarify the situation.

During the past few months the demand for anesthetists was far greater than the supply and we regret our inability to be of assistance to many hospitals that applied to us for anesthetists. It has been suggested by your President that a registry for unemployed anesthetists be established at Headquarters so that any anesthetist desiring work and any hospital requesting anesthetists can apply directly to Headquarters.

In evaluating the work of your organization during the past year we are reminded of our Past President's closing remark in her final report: "I pass the torch on to another and I am convinced that with future care, from this flame can be built a beacon so strong and bright that its light will guide us to the fulfillment of our objectives." As each year passes may we add more rays to that beacon.

In conclusion, therefore, I wish to make the following recommendations to the incoming administration:

1. That every state body continue a close and careful watch over legislation that in any way may affect our interests.

2. The establishment of a registry for nurse anesthetists at the National Headquarters, with an efficient program for immediate action.

3. That an amendment to the Code of Regulations be made regarding the male nurse anesthetist.

4. That during the coming year every effort be made to contact authorities of the different medical associations in regard to the work of the Educational Committee, looking toward the establishment of a national board of examiners for nurse anesthetists.

5. That our organization publish a list of Schools of Anesthesia before the next annual meeting.

During my term of office a sincere effort has been made not only to continue along the line of the outstanding achievements of the past, but in addition looking to the future to nurture and increase the value and importance of this National organization throughout the country. If any degree of success has been ours, it is largely due to the whole-hearted cooperation and loyalty of the Board, officers and various Committees.

Respectfully submitted,

HILDA R. SALOMON
President

REPORT OF EXECUTIVE SECRETARY

Total paid-up membership September 1st, 1936	1110
Delinquent members September 1st, 1936	162
Members resigned during current year	2
Deceased members	2

A total of 218 application blanks has been sent to interested persons, including 136 sent to state secretaries for distribution to their groups.

Notices of acceptance as members were mailed to 326 applicants—287 active and 39 associate.

On September 1st 1550 programs for the annual meeting in Cleveland were mailed to members and others on the mailing list.

The volume of work at National headquarters increased tremendously during the year 1934-35, consequently at the beginning of this year it seemed advisable to establish more permanent and convenient headquarters because the space allotted at the University Hospitals was much too small. Suitable office furniture was purchased and office space was rented at 2245 Cummington Road. A secretary was employed for two half days per week. The arrangement has worked out to the great benefit of the organization.

Because of the continued growth of the organization and the increase in the volume of correspondence, bookkeeping and other detail work, it is recommended that a full time office secretary be employed.

Respectfully submitted,

MARY LUCILE GOODMAN
Executive Secretary

September 29th, 1936

TREASURER'S REPORT

Cash on Hand and in Bank September 1st, 1935		$ 3,942.74
Receipts September 1st, 1935 to September 1st, 1936		
Initiation Fees	$ 333.00	
Dues—National Association portion	3,023.75	
—State Association portion	1,351.25	
For National pins (159 pins)	119.25	
Bank Interest	70.15	
Income—Sales of Advertising Space in Bulletin	876.00	5,773.40
		$ 9,716.14
Disbursements September 1st, 1935 to September 1st, 1936		
Transfers to State Associations	$ 186.25	
Refund dues and fee	3.50	
Stenographic Services	357.00	
Accounting Service	40.00	
Legal Fees	735.00	
Telephone and Telegrams	102.60	
Office Supplies	19.36	
Periodicals and Books	11.00	
Printing and Stationery	120.96	
Postage	215.18	
Convention Expense	687.69	
Publishing Bulletin	1,092.79	
Office Equipment	106.87	
Traveling Expense	42.85	
Expressage	.97	
Office Rent	90.00	
National Pins purchased	51.65	
Miscellaneous	28.08	$3,891.75
Cash on Hand September 1st, 1936		$5,824.39
Consisting of the following:		
Savings Account No. 38726	$5,012.80	
Checking Account	811.59	$5,824.39

In addition to the above receipts as at August 31, 1936, there was an amount of $185.00 due from sale of advertising in the August Bulletin.

The organization has experienced a steady growth during the past year which has been reflected in the increase in cash funds. A condensed comparison of the financial transactions for the year ending August 31, 1936, with the previous years since the organization was started is shown below.

The first dues were received May 3rd, 1932, and in going over the books we find that Miss C. Virginia Godbey, Norfolk Protestant Hospital, Norfolk, Virginia, was the first anesthetist to pay dues in the organization. On January 1st, 1933, the total of fees and dues received amounted to $492.25. The following comparative figures therefore will start from January 1st, 1933.

	Year Ended August 31 1933	Year Ended August 31 1934	Year Ended August 31 1935	Year Ended August 31 1936
Cash Balance at Beginning of Fiscal Year	$ 492.25	$1,933.81	$2,685.58	$3,942.74
Receipts	1,509.86	3,252.29	4,979.77	5,768.90
	$2,002.11	$5,186.10	$7,665.35	$9,712.64
Disbursements	68.30	2,500.52	3,722.61	3,888.25
Cash Balance At End of Fiscal Year	$1,933.81	$2,685.58	$3,942.74	$5,824.39

The books have been audited and the following statement is incorporated in the report:

"I have examined the books and records of the National Association of Nurse Anesthetists and I hereby certify that the statements accompanying this report correctly reflect the financial transactions for the year ended August 31, 1936, and the balances on deposit in the various bank accounts at that date."

Respectfully submitted,

GERTRUDE L. FIFE
Treasurer

September 1st, 1936

REPORT OF THE MEMBERSHIP COMMITTEE

The Membership Committee has held monthly meetings.

The committee passed upon and approved 326 applications for membership—287 active and 39 associate.

The total applications approved since the organization was started is 1523.

Respectfully submitted,

MYRN MOMEYER, Chairman
MARIAN HOLLISTER
MARJORY H. WALKER

REPORT OF EDUCATIONAL COMMITTEE

STANDARD CURRICULUM

The curriculum submitted at last year's convention has been simplified as to wording and condensed in phraseology, the intent and meaning of the original having been carefully preserved. To reduce the likelihood of possible uncertainties of interpretation later on, the teaching high lights of each of the anesthetic agents have been itemized in detail, replacing the mere "specimen outline" which was shown under one heading—"Ether," in last year's report. It is recommended by the Committee that this draft replace last year's, and become the official "Recommended Curriculum."

LISTING OF SCHOOLS OF ANESTHESIA

From time to time suggestions have been made that the National Association issue a list of "certified" or "approved" Schools of Anesthesia; but while this objective is undoubtedly desirable for eventual accomplishment, this Committee feels that all plans so far devised or studied fall short of offering a practical or workable method of bringing about this result.

The Educational Committee feels that the first step in this direction should be a careful listing of the Schools of Anesthesia which now function in the country, this listing to note such details as:

(1) Size of hospital in which school is operated .
(2) Number of anesthetics administered per year by members of the School of Anesthesia.
(3) Number of graduate nurse anesthetists giving actual instruction in anesthesia.
(4) Total number of graduate nurse anesthetists on the Anesthesia staff.
(5) Maximum number of student anesthetists in the school at one time.
(6) Length of course.
(7) Professional degree of the head of the department of Anesthesia.
(8) Anesthetic agents used regularly.
(9) Makes of anesthetizing machines upon which students are trained.
(10) Methods of anesthesia practiced regularly;

and other informative data of this character.

EVENTUAL NATIONAL EXAMINATIONS

The Committee suggests that the real measure of a school's worth and desirability as a training institution, must in the last analysis be determined by the degree of knowledge and skill which is actually shown by those persons whom it graduates; and that therefore the real rating of each School of Anesthesia will eventually be measured by the percentage of its graduates which pass examinations given by some such body as a National Board of Examiners or Certification.

With that thought in mind, and giving heed to the growing feeling that the whole future of the nurse anesthetist and the conditions under which she is to function are likely to be intimately related to affiliation with, and endorsement by, the great National surgical and hospital groups, this Committee feels that it becomes incumbent upon our Association to prepare for presentation to such groups a concrete program which will set forth not only the standard of education and training which a nurse anesthetist is expected to have achieved, but also at the same time furnish it with a working plan for demonstrating whether or not an applicant for certification does possess that knowledge and has acquired the requisite training.

Fortunately our Association already has set forth what the standard of education and training is expected to be (i. e., the already adopted "Recommended Curriculum") so it now remains only to furnish a mechanism for verifying an applicant's achievement of the equivalent of that standard, for us to have a complete plan for presentation to a surgical or hospital group, as a basis for certification.

To possibly fulfill that need, the Educational Committee has begun the preparation of what might be called a "master set" of examination questions, to be used as a basis for the work of an eventual National Board of Examiners for Nurse Anesthetists—such Board of Examiners selecting from this master set those questions which seem most likely to fairly measure an applicant's degree of knowledge of, and training in, this subject.

Obviously, for such a master set of examination questions to serve its purpose effectively, it must be especially comprehensive in scope, must cover quite completely the broad field of training, both theoretical and practical, in accordance with our already adopted standard curriculum. As an illustration of the kind and extent of the queries which would constitute the group in mind, the Educational Committee has compiled some 98 initial typical questions; but before proceeding further with what will be an arduous task, the Committee asks reaction as to the desirability of the plan suggested, and as to carrying the work forward to its conclusion.

In closing this report, the Committee calls attention to the definite trend in the direction of National Boards of Examination by various professional groups, as noted by the recently created American Board of Surgery (for National examination and certification of general surgeons), and also the Council on Dental Education, organized only two months ago "for the examination and listing of (dental) specialists." A carefully worked out plan looking forward to eventual National examination and certification for nurse anesthetists would therefore seem to be peculiarly in keeping with the current trend of professional thought in our fields.

Respectfully submitted,

HELEN LAMB, Chairman
OLIVE L. BERGER
MAE B. CAMERON
MABEL HARD
MARY H. MULLER

September 30, 1936

REPORT OF PUBLISHING COMMITTEE

A statistical report of the three issues of the National Bulletin published in 1935 (February, May and August) as compared to the three issues in 1936 (January, May and August) is hereby sumbitted:

Year	No. of Pages	No. Copies Distributed	Total Cost of Publishing including Postage	Advertising Pages	Advertising Income
1935	149	3,671	$ 762.92	16	$820.00
1936	185	4,600	1,056.24	19¾	911.00

We have made every effort possible to keep the cost of this publication at a minimum during these years when the organization is making a special effort to conserve funds for the carrying out of future programs. On the whole, the publishing of a magazine is an expensive undertaking. Advertis-

ing space sold has helped considerably, but we are convinced that we cannot hope for the publication to be wholly self-sustaining on the revenue from advertising. The commercial companies that have accepted advertising space in the Bulletin have been most cooperative. We sincerely hope that these companies have obtained commensurate benefits and that our association with them may continue in order that the anesthetists throughout the country may see advertisements in each issue of reputable companies manufacturing anesthetic products.

We have been unable to secure a postal permit that would allow us to send the publication out under second class postal rates, because we have been accepting advertising space and we have not been charging a definite subscription price for the publication. If we were in a position to obtain a permit for second class mailing the cost of postage would be cut down considerably. Furthermore, if a subscription fee were charged it would allow us exemption from a sales tax, which in Ohio is three cents on the dollar. We therefore recommend that each member be charged 50¢ per year for the Bulletin, this 50¢ to be deducted from the present dues. In other words, the dues entitling one to membership in the organization would not be increased, but there would be a certain charge for the publication.

The value of any organization project can be measured only by the benefits derived by the members, as a result of such activity. The members alone are the judges. The value of a publication is dependent upon the information contained within its pages. The many letters received at headquarters this year from our members testify to their appreciation of the Bulletin. It is also interesting to note that we have had requests from hospital superintendents, surgeons, and medical directors in charge of Anesthesia Departments, requesting that their names be placed on the mailing list. This general interest has been most encouraging.

It must be remembered that those who are responsible for the management and editorial work connected with this publication are active anesthetists regularly employed in institutions, and needless to say, we have had little opportunity in the past to develop our talents in the publishing field and are indeed humble in regard to our ability in this line of endeavor. We sincerely hope, however, that our efforts have planted the seed for a very fine magazine that will steadily grow in value and will eventually bring to our members a real opportunity for open, informative, practical discussions in regard to all anesthetic drugs and procedures in an Anesthesia Department.

Respectfully submitted,

GERTRUDE L. FIFE, Chairman
ESTHER MEIL
FLORENCE SARGEANT
LOUISE SCHWARTING
GERTRUDE ALEXANDER TROSTER

September 29, 1936

Officers elected for 1936-37

President	Hilda R. Salomon Jewish Hospital, Philadelphia, Pa.
First Vice-President	Verna M. Rice R. F. D. No. 1, Box 116, Mobile, Ala.
Second Vice-President	Olive L. Berger Johns Hopkins Hospital, Baltimore, Md.
Third Vice-President	Eva M. Dickson Brooklyn Hospital, Brooklyn, N. Y.
Treasurer	Gertrude L. Fife University Hospitals, Cleveland, Ohio
Trustee	Clara A. Wurtz, c/o Dr. Marshall Clinton, 200 Wallace Avenue, Buffalo, N. Y.

Miss Mary Lucile Goodman was re-appointed Executive Secretary.

NATIONAL ASSOCIATION IS PRESENTED WITH GAVEL

Miss Ann M. Nightengale, President of the Alumnae Association of the University Hospitals (Lakeside) School of Anesthesia, presented Miss Hilda R. Salomon, President of the National Association of Nurse Anesthetists, with a very beautiful gavel, as a testimonial to Miss Hodgins' splendid achievements. In the presentation address Miss Nightengale said: "May the *smoothness* of this gavel characterize your tenure of office; may the *hardness* of it characterize the firmness of your rulings; may the *weight* of it characterize your decisions; may the skill in the making of it show itself in your *committee appointments;* may its perfect workmanship manifest itself in the *lasting spiritual results* of your labors in this *most honorable and responsible office,* and may the *durability* of the *precious metal* on which the inscription is written, keep ever before you the ideals to which she aspired."

In the acceptance of the gavel Miss Salomon made the following remarks: "In accepting this gavel, it will be my constant endeavor to comply with the requests as beautifully suggested in the presentation. We sincerely hope that our Honorary President, Miss Agatha C. Hodgins, will continue to bestow upon us the fruit of her intellectual genius so that we may all attain the heights of the professional standards to which she has tried to lead us."

IN MEMORIAM

Miss Mary Kelly, for twenty-five years anesthetist at Cooper Hospital, Camden, N. J.

We also remember a beloved surgeon and true friend, *Dr. Charles Frazier*, of Philadelphia.

"May their memory inspire us to emulate their good works and thus sanctify our own lives." HILDA R. SALOMON

OXYGEN

HOWARD T. KARSNER, M.D.*

Professor of Pathology, Director of The Institute of Pathology, Western Reserve University and University Hospitals, Cleveland, Ohio

The purpose of this address is to give a brief general survey of the position of oxygen in nature rather than to bring forward any elaborate discussion of the practical aspects of oxygen in anesthesia. This presentation might serve as a basis upon which practical matters could subsequently develop.

It seems probable that in the early history of the earth, oxygen did not exist as a free gas. Thus, the first manifestations of life upon this planet were of forms that existed without access to free oxygen. We know that as the earlier plants died they were converted into carbon, which furnishes us with our coal supply. It is probable that as this carbonization took place oxygen became liberated into the atmosphere. Subsequently, living forms were developed which required oxygen for their activity. Perhaps in the simpler forms oxygen served as a scavenger to burn up waste rather than as a source of energy. As evolution progressed, forms of life were developed which required oxygen for the production of energy. This naturally leads to some speculation about forms of life which may exist upon other planets. The mere fact that oxygen is not observed in the atmosphere of other members of the solar system is not a final and conclusive proof that some form of life may not exist there.

Oxygen forms a part of our environment and has a bearing on what has been described as the "fitness of the environment." This fitness appears to vary for different types of living beings. Thus, we know that there are bacteria and even a few multicellular forms of life which live without oxygen and even thrive best without oxygen. Furthermore, various forms of bacteria require different concentra-

* Read at the fourth annual meeting of the National Association of Nurse Anesthetists, Cleveland, Ohio, October 1st, 1936.

tions of oxygen in the atmosphere for their best growth. Some are better without any oxygen at all; others do best at an oxygen concentration like that of the atmosphere; still others do best at some point of oxygen concentration between none at all and the usual 21 per cent. Among the multicellular forms are certain intestinal worms. Some of these do best without oxygen, as is true of some which exist in the human intestine. Human intestinal content has no free oxygen and yet these worms develop excellently. The absence of oxygen in the intestine is not true of all mammals.

It is perfectly evident that the higher forms of life are dependent upon oxygen to provide energy but even in these higher forms there are certain cells which can produce energy from the breaking down of sugar rather than the consumption of oxygen. This is true of cells of embryonal type and also cells that take part in the make-up of many of the forms of malignant tumor.

As far as the highest forms of life, including man, are concerned, it must be recognized that there is a possibility of an atmosphere containing too little oxygen and containing too much oxygen. This means that the 21 per cent. oxygen found in sea-level atmosphere is the most suitable for our use. Nevertheless minor variations may occur without serious effects following. Although considerable elevations above sea-level with some reduction in oxygen content are compatible with normal life, nevertheless there are extremes which require physiological adjustment on the part of man. High ascents in balloons and airplanes expose pilots to reduced oxygen concentration in the atmosphere. To be sure, in these days, oxygen tanks provide an adequate oxygen supply. There are, however, people who reside in high mountainous areas who cannot use oxygen tanks and must become adjusted as well as possible to the reduction of oxygen content in this rarefied air. The scientific studies that have been made upon people who have ascended high mountains, upon people who have been residents for considerable periods of time in those high altitudes, and upon those who have gone up in balloons and airplanes, have furnished much valuable information concerning the effects of reduction of oxygen supply. Naturally those who go up in airplanes and balloons are subjected to this change more rapidly than those who climb mountains. Those who are residents in mountainous areas are subjected to the condition for a long period of time. There are various other ways by which the body is subjected to reduced amounts of oxygen. For example, in anemia, the concentration of hemoglobin in the blood may be so reduced that it cannot take out of the inspired air enough oxygen to satisfy the body requirements. There are certain diseases in which proper transfer of oxygen from the blood to the body tissues cannot take place. Thus the important factors involved are reduction of oxygen in the atmosphere, diseased conditions of the blood so that a sufficient amount of oxygen cannot be absorbed, and other diseases which prevent adequate transfer of oxygen from the blood to the tissues.

The effects on mountaineers and airplane pilots can be duplicated by placing men and animals in experimental chambers in which the oxygen is artificially reduced in amount. Observations of this sort show that the effects observed at high altitude are due to oxygen reduction rather than to reduced barometric pressure. When

the reduction of oxygen is brought about suddenly, the symptoms and signs are somewhat similar to those observed in drunkenness. Prolonged exposure to reduced oxygen concentration leads to symptoms and signs like those of fatigue. For example, the aviator reports that when he gets up to a considerable elevation, 15,000 feet or more, at first he feels strong and well, soon he suffers with breathlessness, his muscles become weak and he may then get a headache. Continuing in this atmosphere or going higher, so that the reduction of oxygen is greater, he loses his memory, his judgment becomes disturbed, his sight and hearing are dulled and ultimately if he continues he becomes unconscious. When a man ascends a mountain the manifestations are less severe and come on somewhat more slowly. Essentially, however, the manifestations are very much the same, namely, first a feeling of well being, then sensitiveness to cold, then lightheadedness and lassitude creep over him more and more. He may become nauseated and vomit, particularly if he undertakes any exercise at high altitudes. Ultimately he may experience complete prostration. It may be that the reason that aviators do not develop nausea is because the personnel selected for that occupation is one not at all susceptible to the various things which may induce nausea. This is not necessarily true of those who climb mountains.

The effects of this reduction of oxygen, then, depend upon the abruptness with which the individual is exposed and the extent of reduction. Furthermore, there is the physical condition of the individual, perhaps also constitutional and inborn factors, to be considered. Thus, we know of people who cannot ascend a mountain of only moderate height, such as 7,000 or 8,000 feet, without discomfort, while others can go to greater height without feeling anything in the way of severe effects. Even the same individual may react differently at different times. There are various bodily mechanisms which come into effect when the body is exposed to low oxygen concentration. The rate of breathing is increased and the breathing is often of increased depth. At any rate, ventilation in the lungs is definitely augmented so that in a given period of time the lungs contain an amount of oxygen similar to that which would be provided by normal respiration of normal air. I do not wish to convey the impression that this is a purposive action on the part of the body. It is simply a response to the stimulus of reduced oxygen concentration. The heart rate is increased and the volume of blood circulating through the body is increased. This makes available to the tissues greater quantities of oxygen than would be true if normal rates of circulation were to continue. There is a change in the acidity of the blood, so that the transfer of oxygen from the blood to the tissues takes place more readily. If a sufficient amount of time elapse, the actual amount of hemoglobin in the blood may be increased and, of course, the more hemoglobin in the blood, the greater the amount of oxygen that can be taken up from the lungs to become available to the tissues.

Whereas residence at moderate elevations shows no noteworthy effects, living and working in high altitudes such as those of the Andes lead to changes in bodily structure which are presumably due to the reduced oxygen content of the atmosphere. Thus, among workmen in areas of this sort, the characteristic picture is of a man with a barrel chest, a man whose

breathing is permanently more rapid, a man whose heart is definitely enlarged, a man whose blood shows a considerable increase in the number of red blood corpuscles. These changes are those to be expected as the result of prolonged stimulus of the same type which produces the manifestations of acute deficiency observed in mountain climbers and aviators.

It will be seen then that decreases in the amount of oxygen in the atmosphere are observed under natural conditions in high altitudes and under artificial conditions in chambers where the amount of oxygen is reduced. As has been said before, these changes are due wholly to reduction in the amount of oxygen. They do not depend upon the fact that at high altitude barometric pressure is reduced.

In contrast to these decreases, increases of oxygen of any significant degree are not likely to be observed under natural conditions. It might be thought that a man going into a mine would be subjected to increases in oxygen concentration. That is probably true, but the depth of a mine below the surface is not to be compared with the elevation of a mountain above the surface. Thus the change in the mines apparently has no significant effect. Increases in the amount of oxygen are largely, if not entirely, the result of artificial conditions. When barometric pressure is increased, the concentration of oxygen to which the individual is exposed is also increased. This occurs particularly among the workers in caissons. Their exposure to the increased oxygen concentration is for so short a period of time that no effects from this change are observed. Caisson disease, or "the bends" is due to sudden release from the high barometric pressure, not to the increased oxygen content of the atmosphere.

The high oxygen concentrations that are of especial interest to medical groups are those which occur in oxygen tents, oxygen chambers and in the course of anesthesia. There are physiological responses and there may be pathological effects. Physiologically there may be slowing of the pulse, decreased rate and depth of respiration, and constriction of the blood vessels of the lungs. There is, however, no increase in the amount of oxygen in the blood, because it naturally is saturated at normal concentrations.

The pathological effects have been studied in experimental animals. The discoverer of oxygen, Lavoisier, recognized that oxygen can be irritant. It is of extraordinary interest that oxygen, essential to all the higher living forms, may operate, when present in high concentrates, like a poisonous gas. Some years ago, at the request of and with the aid of, Dr. Francis G. Benedict of the Carnegie Nutrition Laboratory, I had the privilege of studying the effects upon rabbits of exposure to high concentrations of oxygen in the atmosphere at normal barometric pressure. Other investigators had reported the occurrence of pneumonia when animals were exposed to high oxygen concentrations, but many such studies were made with increased barometric pressure. I was privileged to give an exact description of the pneumonia and to show that it is a fibrinous bronchopneumonia. Bacteriological examination of the lungs demonstrated that the number of bacteria in the pneumonic lung was small, and indeed smaller than was usually the case with normal lungs. Thus it was established that the pneumonia was not due to bacteria but caused by the ir-

ritant quality of the oxygen. It was found that in the rabbit an exposure to concentrations in the neighborhood of 80 to 90 per cent. oxygen or higher would lead to the production of a pneumonia in from 24 to 48 hours. It was definitely shown that as the result of exposure to less than 80 per cent. of oxygen during a similar period, pneumonia did not develop. The question then arose as to what may be expected from prolonged exposure to lower concentrations. It was found that animals exposed to concentration of about 60 per cent. over the course of 11 days did not develop pneumonia. The same was true of exposure to concentrations of 75 per cent. Thus it would appear that 80 per cent. or thereabout is the critical point below which pneumonia does not develop even as the result of prolonged exposure, and above which pneumonia develops from a short exposure of from 24 to 48 hours. While it is true that in the animals exposed to lower concentrations over prolonged periods there was some hyperemia of the lungs, this gives no assurance whatever that had this exposure been prolonged, any pneumonia would have developed. Undoubtedly such a pneumonia has secondary effects upon other organs. Thus the action of the heart is embarrassed and deteriorative changes may occur in liver, kidney and other organs.

The question naturally arises as to whether or not these observations may be applied to man. I do not happen to know of any circumstances under which a man would be exposed to atmospheres containing 80 per cent. or more of oxygen during the course of 24 hours or more. It is reasonable, however, to assume that long exposure lasting over several hours in concentration less than 80 per cent. would have no serious deleterious effects. It would seem wise, in the therapeutic use of oxygen, to keep the concentration of the gas well below the critical 80 per cent. Full therapeutic effects can be produced at much lower concentrations. It seems unlikely that any pathological effects upon the lungs could be produced by oxygen in anesthesia, for even though the concentration may be high, it is not operative over any prolonged period.

It has been shown recently that prolonged exposure to high oxygen concentration together with high barometric pressure produces permanent changes in the small arteries of the lungs. This requires confirmation. Furthermore, it must be determined whether or not this effect is due wholly to the oxygen concentration, to the increased barometric pressure, or to both factors.

This is but a brief review of some of the effects which may follow upon decreases and increases in the amount of oxygen in the atmosphere. It will serve to show that the matter has been extensively studied and that a volume of informative material has been discovered. Investigations continue in this field and undoubtedly will yield valuable results in the future.

Permit me to express my gratitude for the privilege of having been with you at this meeting and to thank you for your courteous consideration of this address.

CYCLOPROPANE

HELEN C. KRAUSE and FLORENCE C. SCHWAB*

Temple University Hospital, Philadelphia, Pa.

We are entering a new era of gas anesthesia — new, not only from the standpoint of the type of gas available, but new in the method of administration and in the signs of anesthesia.

In order to introduce successfully a new anesthetic it is necessary to be extremely cautious so that no accident will result. It was not possible for us to get a medical graduate anesthetist in Philadelphia to give us instruction in the administration of cyclopropane and we are deeply grateful to Doctors Stiles and Neff for having given us an opportunity to observe two cases. Following these observations, we carefully picked our way and we have finally acquired confidence in the gas and the new technique. Needless to say, our first cases were not carried sufficiently deep to secure the desired relaxation for intra-abdominal surgery, and we were somewhat disappointed. However, the more we used cyclopropane the more we realized the breadth of the margin of safety. Many of our first cases were given small quantities of ether; today ether is infrequently added and we get sufficient relaxation in about 95 per cent. of the cases. We have not used ether in any of the extra-abdominal group.

We wish to emphasize the fact that cyclopropane should not be administered by an inexperienced anesthetist. Any anesthetic agent which will produce complete anesthesia in from two to four minutes should be handled with fear and respect. An agent which in deep anesthesia causes cardiac irregularity, rapid or slow pulse, is dangerous. We are of the opinion that if the anesthetist bears the above facts in mind, this anesthetic is safe for the patient. The anesthesist who has a thorough knowledge of the administration of ether, chloroform, nitrous oxide, ethylene and ethyl chloride by the various methods, should have no difficulty in acquiring skill in the administration of cyclopropane. The well trained anesthetist exercises "care and caution" in each case and certainly cyclopropane requires the same, plus an understanding of its rapid action and the signs and conditions existing in the various stages.

Description of the Gas: Cyclopropane, or trimethylene bromide, a hydrocarbon, was first prepared by Freund in 1882. No use was made of this gas until 1929, when Henderson and Lucas studied it. It is prepared commercially by the reduction of an alcoholic solution of trimethylene bromide in the presence of metallic zinc. Purification is important. It liquifies at a pressure of 75 pounds to the square inch, and one ounce of the liquid yields four and one-quarter gallons of gas at atmospheric pressure. It is heavier than air. It is not soluble in water, but is soluble in lipoids (fats). The gas is inflammable and will explode in 3.8 per cent. concentration in oxygen. The same precautions to prevent explosions should be observed when cyclopropane is used as when ether-ethylene is being administered.

Cyclopropane is given by means of

* Read at the fourth annual meeting of the National Association of Nurse Anesthetists, Cleveland, Ohio, October 1st 1936.

especially constructed machines or especially designed parts which can be attached to almost any type of gas machine. From 10 to 30 per cent. of the gas is mixed with 70 to 90 per cent. of oxygen. Cyclopropane is very expensive (35¢ per gallon), therefore the machine should be equipped with a soda lime filter (carbon dioxide absorption unit). The use of soda lime and the high percentage of oxygen used brings the cost per case to about $1.50. The cost compares favorably with the cost per case when the other gases are used (nitrous oxide and ethylene).

Technique of Administration: Our experience with cyclopropane, although somewhat limited, covers a series of over 200 cases, the majority of which were intra-abdominal. A new model gas machine, equipped with the soda lime filter for the removal of carbon dioxide, was used. All patients were given a preliminary hypodermic of one-sixth of a grain of morphine and 1/150th of a grain of atropine, one-half hour before the anesthetic was started.

Induction: The induction is started with a mixture of from 600 to 800 c.c. of cyclopropane and about 2000 c.c. of oxygen. This is continued for a period of from 2 to 4 minutes, depending upon the patient and the degree of relaxation desired. As soon as the desired depth of anesthesia is reached, the cyclopropane is reduced to about 200 to 300 c.c. and the oxygen to about 1200 or 1500 c.c. continuous flow. The soda lime valve is opened and the patient is ready for the incision. If the operation is one requiring deep anesthesia, the above technique may be modified to suit the individual case and the surgeon. The induction of the anesthesia is rapid and the patient passes into the stage of relaxation quietly, without manifestations of mental distress. There is no stage of rigidity, and it is rarely necessary to use an artificial airway.

The eye signs must be watched carefully, as when ether or chloroform is being given. The pupils are contracted, and it has been our practice to keep the eyeball slightly active throughout the duration of the anesthesia. The color should be pink (a high flush), and is of no assistance in determining the depth of the anesthesia or the condition of the patient. The respirations are about normal, or may be somewhat depressed, depending upon the depth of anesthesia. The rate, ryhthm and volume should be watched carefully; any change is of real importance. The effect of the anesthetic agent on the respirations, the removal of carbon dioxide, and the hyperoxygenation all tend to produce conditions which need constant attention. There is no wide diaphragmatic swing, as is so frequently seen in the lighter stages of ether anesthesia. The abdominal movements during inspiration and expiration are greatly reduced. This is of importance because a lighter degree of anesthesia can be maintained, yet the surgeon is not aware of the incompleteness of relaxation, as with ether. The pulse is increased in volume in the induction, and may be increased in rate. The blood pressure of the patients on whom we took readings was slightly increased in this stage.

Maintenance: The maintenance stage is evidenced by quiet, normal, or slightly depressed respirations. The rate, rhythm and volume should be constant, and any change should be considered a change in the depth of anesthesia. The pulse is the most valuable guide and should be constantly checked. Any change in the rhythm, volume or rate is significant

and an immediate change should be made in the mixture of the gases. Oxygen should be given in higher concentration until the pulse returns to normal. If the lightening of the anesthesia is in any way likely to interfere with the surgeon and if there is doubt as to the safety of giving more cyclopropane, it is better judgment to add a small quantity of ether.

Recovery: As soon as the intra-abdominal surgery is finished, the packs removed and the final inspection complete, the cyclopropane is discontinued and the oxygen is reduced to about 200 to 300 c.c. continuous flow until the skin is to be closed, at which time the filter valve is closed and the exhaust valve opened. If the surgeon works rapidly, the patient is given full oxygen until the dressings are placed. By this time the patient is reacting. The stage of recovery is quiet and if no ether has been given there is no delay in the return of reflexes, such as the movements of the eyelids, swallowing, retching or vomiting. Some vomiting occurs before the patient regains consciousness. Vomiting occurred in about one-third of our patients, but there was no instance in which there was prolonged nausea or vomiting even in patients who were in the operating room as long as one to two hour periods.

Post-operatively, the patients seemed to be more comfortable. They received liquids two to four hours after returning to the room, and in general they were in better condition than when ether was given for the same period of time. This applies especially to the abdominal cases.

Induction and Maintenance in Extra-abdominal Cases: The same technique of inducing anesthesia was used in the extra-abdominal group as for the intra-abdominal group, but the maintenance period was modified. Instead of carrying a continuous flow of about 200 to 300 c.c. of cyclopropane and from 1200 to 1500 c.c. of oxygen, we used the intermittent flow. As soon as the patient was in the depth of anesthesia desired, the cyclopropane was discontinued and oxygen reduced to metabolic requirements, namely, 200 to 300 c.c. constant flow; the filter valve was opened. In a large percentage of the cases the operation was completed without the addition of more cyclopropane. The average length of time was twenty minutes, although we had a few cases in which we carried the desired depth of anesthesia for forty minutes. When using the intermittent flow technique, much depends on the amount of premedication used, the patient and the degree of reflex irritation from the surgery.

The foregoing study included 200 cases, most of which were intra-abdominal. One hundred and twenty-five in this group were gynecological —plastic and section and hysterectomy. We had about thirty extra-abdominal cases, which were major operations, and the remainder were minor cases, such as orthopedic, incision and drainage, *et cetera.* We were greatly handicapped in securing cases because our surgeons use spinal anesthesia for most of the operations below the diaphragm.

About 5 per cent. of the intra-abdominal group required small quantities of ether, ranging in amounts from 5 to 25 c.c.

Our best results were obtained when the patients had received preliminary medication, such as morphine and atropine, or small doses of other narcotic drugs, such as avertin, nembutal and the barbiturates. Only two of our patients were given avertin, and then only in a 40 milligram dose.

The patients ranged in age from 6 to 72 years, the majority of whom were in good physical condition. However, we did have three very poor risk cases. There were four fatalities, none of which were attributed to the anesthetic.

Precautions Against Inflammability and Explosibility:

For the benefit of anesthetists who have not had experience with ethylene, we are listing below some of the precautions necessary:

All light switches, plugs and cables should be in good condition to prevent short circuiting.

All electric lights should be plugged in before the anesthetic is started.

No suction apparatus with motor should be kept in the operating room.

No live flame, cautery, or high frequency apparatus should be used in the room.

Never use oil or grease on any part of the gas machine.

Close all cylinders at the completion of the anesthetic and be sure that the breathing tubes and the rebreathing bags are emptied.

Do not drop cylinders and be sure to keep extra supply in a cool place.

We feel reasonably safe because the machine is a closed cycle and therefore an accumulation of moisture takes place in the unit.

SUMMARY

The Advantages of Cyclopropane:

Excitement and the stage of rigidity are absent.

It is rarely necessary to use an artificial airway.

Anesthesia is produced without mental distress.

There is no mucus accumulation or irritation and the cough reflex is absent.

The rate, rhythm and volume of respiration can be controlled.

The limited respiratory excursion facilitates surgery, especially in the upper abdomen and thorax.

Anesthesia is obtained without anoxemia, which is a protection.

The relaxation is superior to that of nitrous oxide or ethylene; indeed, in about 95 per cent. of cases it is as satisfactory as that of ether.

Reflexes return rapidly, which tends to prevent post-operative complications.

The rapid induction, the smooth, quiet maintenance, and the quick recovery are very satisfying to the patient and the surgeon, as well as the patient's relatives.

There is no need of large storage space and handling of heavy cylinders. A 75-gallon cylinder of cyclopropane will be sufficient to anesthetize from fifteen to twenty-five cases, or about twenty hours of anesthesia time.

The cost per case compares directly with that of nitrous oxide or ethylene, the anesthesia is better and it is rarely necessary to add ether.

There is less objection to a second anesthetization.

The Disadvantages:

The possibility of static spark and the explosibility as well as the inflammability may be considered under this heading. However, in the clinics in which the anesthetists are accustomed to using ethylene there should be no accident.

It is necessary to purchase new machines or new attachments for old machines in order to use cyclopropane.

The anesthetist must have experience with ether, nitrous oxide and other inhalation anesthetics, as well as an understanding of the new technique for administration of this gas.

CONCLUSIONS:

No inhalation agent so far used in the history of anesthesia has approached the ideal as closely as has cyclopropane. The patients apparently go under the anesthetic as if into a normal sleep. The absence of excitement and rigidity and profuse perspiration, the regular thoracic type of breathing, and the ease in maintaining the depth of anesthesia desired, tend to keep the patient in better physical condition for a longer surgical period than do ethylene and ether. We have not found any of the older and frequently used anesthetic agents to be as satisfactory in all types of cases, conditions and ages. The minimal degree of toxicity, nausea, vomiting and gas distention should encourage us to use this gas.

The possibility of post-operative complications is markedly reduced because of the absence of irritation to the mucous membrane, and the rapid return of the reflexes. All of the above mentioned facts add to the comfort of the patient.

We hope that in the near future this gas will replace ether, ethylene and the sequences of ether-ethylene, in about 90 per cent. of the cases in which inhalation anesthetics are used. At Temple University Hospital it has replaced ether-ethylene in a high percentage of cases.

Under proper anesthetic conditions, it is our duty to use the new anesthetic agents and methods of administration as soon as they have been proven superior. It is our belief that all anesthetists should be capable of administering any anesthetic agent, and that the field of anesthesia will be open to nurses just as long as they keep step with the advancements in anesthesia.

We wish to thank you for the privilege of telling you of our experience with cyclopropane, and we hope that we have succeeded in dispelling some of the fears in connection with the administration of this gas.

THE IDEAL NURSE ANESTHETIST

SISTER JOHN EDWARD, S.C., R.N.*

Good Samaritan Hospital, Dayton, Ohio

By way of preface I would relate something of the story of anesthesia that has come down to us even from the remotest ages of history. I would recall a few of the many attempts made in far-away times to render a sufferer insensible to pain. While it is beyond my power to connect these ancient efforts, link by link, with the success of modern anesthesia, a fascination for prying into the distant past urges me to mention these old endeavors to escape from pain.

In the second chapter of Genesis, twenty-first verse, we read: "Then the Lord God cast a deep sleep upon Adam; and when he was fast asleep, He took one of his ribs, and filled up flesh for it." The Talmud, a Holy Book of the Jews, contains reference to the ancient use of drugs for inducing sleep, and other historical records

* Read at the fourth annual meeting of the National Association of Nurse Anesthetists, Cleveland, Ohio, September 29th, 1936.

say that both the Jews and the Chinese gave condemned criminals narcotic preparations to lesson the agony of horrible tortures inflicted upon them.

The earliest literary mention of an anesthetic occurs in the *Odyssey* where Homer sings of Helen "casting a drug into wine whereof they drank, a drug to lull all pain and anger and bring forgetfulness of every sorrow." Herodotus, the Greek historian, speaks of the Scythians as inhaling a variety of hemp which caused sleep. This was probably the same plant which still furnishes hashish (hasheesh) to the Orientals. In the chronicles of ancient Rome we find evidence of the use of drugs to stupefy against pain. Pliny, the Roman author whose "Natural History" has given later historians "color and detail to embellish their descriptions of life at the opening of the Christian era," mentions the analgesic power of the rocket plant and the mandrake, a wine infusion of which was sometimes taken by criminals about to undergo scourging or crucifixion.

In the play "Cymbeline" Shakespeare makes the court physician, Cornelius, prescribe a drug

"Which will stupefy and dull the
senses awhile,
. . . . . but there is
No danger in the show of death it
makes,
More than the locking up of the
spirits a time,
To be more fresh, reviving."

And so on, down through the centuries we find records of the use of drugs to deaden pain, until we come to the discovery and employment of general anesthetics about ninety years ago.

Here I leave history and go back to "the ideal nurse anesthetist," as we would have her in the year of Our Lord 1936. And now let us consider the qualities she must have to succeed in her noble calling:

First, there must be the sympathetic understanding of pain which produces that tender, quiet, indefinable power of assuring the sufferer that his misery is realized and shared;—a gentle, soothing ministration of comfort, under whose spell terrors and desolation take flight; the ability to see in every face in hospital ward or room, the visage of the Ideal Sufferer on the Cross, and to hear across the years the words which once again on the last day shall ring from the ramparts of Heaven: "As long as you have done it to one of my least brethren, you have done it unto Me." *These* the requisites,—*this* the portrait of the Ideal Anesthetist.

Is there any terror comparable to terror of the surgeon's knife? Is there any desolation more desolate than the abandonment felt by the patient who is wheeled for the first time into the operating room where he may find life, or he may find death? To the patient who is wheeled into the surgery with these feelings, what a source of comfort and of hope is the quiet figure who meets him at the door with smiling assurance and casually leads him into conversation that holds in abeyance the thought of the coming ordeal, and who when the crucial moment arrives bends over him with eyes that see his pain, his terror, his desolation, his aloneness; with firm, cool fingers that calm his racing pulse, with strong confidence that allays his fears; with soft voice soon to sound infinite depths away, persuading "Take a deep breath. That is fine! You are doing splendidly." And when the blackness begins to swoop down upon him, save for one whirling spot of light, he does not

fight the terror, because he knows that that source of hope and comfort is standing right at his head, ready to sense danger and to save him from it. Thus, confidently, the patient lapses into unconsciousness, because among the faces above him (the surgeon's — keen, alert and skilled, yet sometimes professionally impersonal, and the attendants', of necessity absorbed in the surgery) —his closing eyes have glimpsed the sympathetic face of the anesthetist who sees no one in the room but him who is her special care.

The gulf of terror bridged for the patient, the anesthetist owes him one more important service. She should accompany him back to the room after the operation. I need not detail for you the dangers consequent upon a relaxation of vigilance when the patient is coming from under the influence of an anesthetic. The orderly or attendant cannot meet the exigencies of the case, for which the anesthetist is specially trained. Arriving at the room, she should be alert to notice any condition in the room that might lead to post-operative complications. Then day after day, until the patient is ready to leave the hospital, she must evince an active interest in the patient's welfare.

Does idealism on the part of the nurse anesthetist end with her conscientious duty toward the patient? By no means. There is yet a higher ideal—the ideal by which she becomes the copartner with the surgeon in his divine art of rebuilding the broken body which is the dwelling place of Divinity. The anesthetist owes a sacred duty to the surgeon with whom she is working. She must have interest in surgery and some knowledge of it, and she must have interest in the welfare of the surgeon. She must think quickly, but act deliberately and with conviction. She is the mediary between the patient and the surgeon. She is the monitor, the adviser, the signaller of the S O S to the surgeon. Every heartbeat of the patient, every breath, every slight indication of change or evidence of shock, she must note. She must observe caution in controlling the intricate and delicate mechanism of the human body on the table before her. And insofar as she observes this caution, so far does she make herself worthy of the absolute faith and confidence that the surgeon places in her valuable judgment, which has been acquired by experience.

What does the conscientious surgeon require of the anesthetist? I recently put this question to just such an eminent surgeon. This is his reply:

The surgeon requires of her

Off Duty

That she be courageous and forbearing;
That she be a student of the liberal arts;
That she be progressive and liberal in her acceptance of new and advanced ideas in her field;
That she attend the association meetings of her profession;
That she observe the Golden Rule.

On Duty

That her own physical condition be of the very best;
That she be alert and observant;
That she speak only when necessary;
That she modulate the tones of her voice;
That she be conservative, yet simple and natural;
That she think quickly and anticipate emergencies;
That she guard against rushing. Better not to administer an anes-

thetic at all, if she cannot spare time to its proper administration.
That she be patient and practice forebearance;
That she be confident and competent;
That her dignity and efficiency inspire confidence;
That her thousandth anesthetic be more carefully administered, if possible, than her first.

High ideals, you may say, but we are speaking of the *ideal anesthetist*, not of the mere machine. The surgeon depends to a great extent upon his anesthetist for the success of his work. Yet the anesthetist must always remember that with the surgeon rests the final decision in all matters, that his is the final responsibility, and that to him she owes splendid cooperation. Dare she fail him? Dare any young woman enter the profession with only the means of earning a livelihood as her motivating principle? Is it not her bounden duty first to set before herself the supreme ideal, then to enter heart and soul into her training that she may excel in the application of the fruits of that training? Mediocrity should have no place in the vocabulary of the professional anesthetist. Mediocrity in our profession is twin sister to criminal neglect.

In these closing words of her message to the Association in 1933, our esteemed Honorary President, Miss Agatha C. Hodgins, established a high ideal for the members of this Association:

"Let us keep our abiding faith, that each component group, now building their part of our organization, may so embody in their work the spiritual qualities of courage, simplicity, endurance and good judgment, that the integral whole may give warmth, light and security to the present generation and be of continuing beauty and usefulness to generations coming after us." At that same meeting the distinguished speaker, Mr. Robert Jolly, paid high tribute to Miss Hodgins. Quoting Emerson: "Every successful institution is the lengthening shadow of some man or woman," Mr. Jolly said: "Your institution is the lengthening shadow of Miss Hodgins."

Somewhere, long ago, I came across these lines:

"This learned I from the shadow of a tree,
That to and fro did sway upon the wall;
Our shadow selves—our influence may fall
Where we can never be."

In Miss Hodgins' own words, her spiritual qualities of courage, simplicity, endurance and good judgment shall give warmth and light and security to those fortunate to come under her influence, and shall be of continuing beauty and usefulness to generations of nurse anesthetists who shall never look upon her face.

A final point: The time element requires that I treat with brevity a topic of no little importance—the cultural training of the young woman who enters the professional field. Culture is not a luxury to be enjoyed by only the few. It is as essential to the nurse as it is to the social leader. The anesthetist whose ear is attuned to the warbling of a bird or to the harmony of a symphony; or who can see life as . . . . "a many colored dome of glass
Staining the white radiance of Eternity,"
will not be less attentive to her calling to preserve that life. "When a woman's mind can feed on music and art and literature, her happiness grows

out of her work as the color-petals out of a flower. She is faithfully helpful, and compassionate, and all her emotions become steady, deep, perpetual and vivifying to the soul as the natural pulse to the body."

"Mighty of heart, mighty of mind,—magnanimous—to be this," says Ruskin, "is indeed, to be great in life; to become this increasingly, is indeed to advance in life—in life itself—not in the trappings of it."

THE BANQUET

The annual banquet of the National Association of Nurse Anesthetists was held Tuesday evening, September 29th, 1936, at the Hotel Carter, Cleveland; attendance 236.

The following were seated at the speaker's table: Miss Hilda R. Salomon, President National Association; Miss Agatha C. Hodgins, Honorary President; Dr. Daniel P. Quiring, speaker of the evening; Dr. Carl H. Lenhart, Professor of Surgery, Western Reserve University Medical School; Dr. George W. Crile; Dr. William E. Lower; Dr. Robert H. Bishop, Jr., Director University Hospitals of Cleveland; Mrs. John A. Hadden, Chairman Anesthesia Committee, University Hospitals of Cleveland; Dr. Jerome Gross, guest violinist; Miss Alma C. Foust, President Alabama Association; Miss Margaret McCoppin, representing California Association; Miss Kathleen Cleary, Treasurer, Minnesota Association; Miss Emma Easterling, President Mississippi Association; Miss Ida M. Edwards, President, New York Association; Miss Lucy E. Richards, President, Ohio Association; Miss Marian Robinson, President, Pennsylvania Association; Miss Dorothy Hoadley, President, Texas Association; Mrs. Gertrude Alexander Troster, Vice-President, Tennessee Association; Miss Vera G. Copeland, President, Virginia Association; Miss Mary Lucille Goodman, Executive Secretary, National Association.

PROGRAM

Presiding - - - - - - - Hilda R. Salomon, President

Introduction of Distinguished Guests

Violin Solo - - - - - - - - - - - Chaconne-Vitali

JEROME GROSS, M.D.

Address—"High Lights of an African Safari"

DANIEL P. QUIRING, PH.D.

Violin Solo - - - - - - - - - - - Jerome Gross, M.D.

Slavonic Dance No. 1 in G Minor - Dvorak-Kreisler
Allegro - - - - - - - - - - - - - Fiocco
Hungarian Dance No. XVII - - Brahms-Kreisler

Musical Selections during Dinner

Andre Callot - - - - - - - Violin
Leon Machan - - - - - - - - Piano
Raymond Gerkowski - - - - - Cello

Members of Cleveland Orchestra

HIGH LIGHTS OF AN AFRICAN SAFARI

DANIEL P. QUIRING, Ph.D., Cleveland, Ohio

I feel a slight degree of trepidation in placing myself in the hands of this audience. Whether or not that is due to a throwback, due to feelings engendered as a patient in the operating room, or whether I feel you have superior powers of observation due to your ability in the operating room, I don't know. I realize, of course, on second thought, that such feelings are entirely unwarranted. I know that the soothing voice, the low tones employed by the nurse anesthetist before the patient goes under, are what make the operation bearable from the standpoint of the patient and make it successful from the point of view of the surgeon and the patient as well.

That is quite in contrast with the experience I had while serving as surgical assistant with a certain army surgeon. His method of quieting the patient, when the latter became afraid or unruly just before going under, was to curse at him and threaten him with his fists. Under such conditions, of course, anesthesia was scarcely indicated since the patient was ready after such treatment to give up without further resistance.

It was my pleasure during the past winter to be associated with the Cleveland Clinic Expedition to South East Africa. This expedition was under the direction of Dr. G. W. Crile and consisted of Dr. and Mrs. Crile, Mr. Fuller of the Cleveland Museum of Natural History and myself. In addition, when we arrived in Africa we had the services of an experienced guide and hunter, Captain Hewlett; Mr. Cooper, a young English zoologist; and other personnel associated with our permanent camp.

I want to say a brief word in connection with the objectives of this expedition. I believe the expedition was unique in that it represented so far as I know the first systematic attempt to study the energy system in a large group of wild animals living under natural conditions, where the law of tooth and claw prevailed, where the principle, "survival of the fittest," operates with relentless efficiency, where it is a constant struggle, so that the animal to persist for any length of time must be fit.

The theory with which the expedition concerned itself may be expressed as follows:

Differences exist in the activities of animals. Such differences in ac-

tivity have a definite physical basis for their being, since muscle or skeleton do not act without an activating mechanism. If this is so then it must follow that the differences in the degree of energy expended are reflected in the mechanisms which make the expenditure possible. In other words we would expect differences in complexity and degree of development in the adrenal sympathetic mechanism, in the size of the thyroid and in the innervation of these glands. We know that the thyroid governs the rate of normal energy expenditure in an animal, and we know further that the adrenal gland may modify this rate. Consequently, we should be able to evaluate energy expenditure in terms of degree of development of these systems. In the pictures which I shall show you I shall attempt to make specific reference to some of the points I have raised in connection with this concept.

Slide 1. In our journey to Africa we passed through the Mediterranean Sea, through the Suez Canal, then through the Red Sea and the Indian Ocean to Mombasa, which lies on the Eastern coast of the continent and which is the chief port of Kenya Colony.

You may recall that in the fall and winter Mussolini was engaged in his war for conquest of Ethiopia. There was considerable ill feeling between the English and the Italians. We had stopped at Genoa on our way down and although we were on a British boat and even though there were rumors and predictions of all kinds of trouble with the Italians, we experienced none. In passing through the Suez Canal we realized something of Mussolini's task, since it required an outlay of approximately $25,000 in gold for everyone of his troop ships to pass through the canal; furthermore, this had to be paid in cash, since the owners do not accept I.O.U.'s for canal toll. When we passed Italian Somaliland we realized that Mussolini's troops had to cover some 3,000 miles to reach their destination in Africa.

From Mombasa we worked inland to Arusha by motor. This is a distance of approximately 260 miles; and from Arusha we passed 90 miles to Maji Moto, our permanent camp. This particular area is unique in some respects in view of the concentration of game there. I might say that we found virtually all of the types we were interested in securing within a few miles of our camp. All told, we collected over 220 specimens and made dissections on over 100.

I wish to say just a word with reference to the great Rift Valley. I am sure that you are all acquainted with that term. It is used to designate a colossal depression which occurred in fairly recent geological time, a vast geological disturbance which extended over three time periods; the last about 100,000 years ago which created the Sea of Galilee, the Red Sea and part of the Indian Ocean, created a system of parallel inland lakes in Africa and the great Rift Valley as well. The Rift Valley runs in a northerly-southerly direction for several hundred miles and is approximately forty miles wide. At the margins of the depression the original wall of the continent rises up to some 1000 to 2000 feet. The lowest portions of the valley form lakes. At the margins of the lakes are plains and the higher lands at some distance from the lake margins are forested. This forest extends along the so-called escarpment or Rift Wall. I shall come back to the Rift in connection with the description of our camp.

I had always imagined Mombasa to

be a large industrial city modeled after our own active cities. Instead I found it a large sprawling place with a large negro and Indian population. The outstanding features about Mombasa, however, were the immense baobab trees. The limbs and leaves seem ridiculously small in comparison with the huge trunks. We found at one spot inland a tree which had been hollowed out for a home by an enterprising native. The wood appeared rather pulpy and soft.

Next Slide: This is a picture of the great Mount Kilimanjaro, the highest peak in Africa, something over 19,000 feet in height. It has a perpetual dome of snow although it lies within three degrees of the equator. It is some 200 miles around the base of this mountain. A whole system of buttresses in the shape of supporting hills extends from the sides of the mountain. Large numbers of tribes live on the mountain side almost up to the snow line.

Next Slide: These are the world-famous mimosa trees. The mimosa is one of the acacias, sometimes called the thorn tree. You will notice they are somewhat flat at the top, which gives the country a peculiar appearance.

Next Slide: This shows Dr. and Mrs. Crile's introduction to the camp.

Mrs. G. W. Crile and pet Thompson gazelle

Some four or five miles from our permanent base a small, intermittent stream passes from the high plateau into the Rift Valley. This particular spot is known as Baron's Drift. At the time of heavy rains it is virtually impassable. It has received its name by virtue of the fact that some German Baron was stuck there a few years ago.

Next Slide: This is a picture of our permanent camp in the margin of the Rift Valley. The huts are of native construction. Immediately in the background you will observe the Rift Wall. This represents the margin of the old plateau. The depressed area extends some forty miles to the east, the point where the huts stand. Immediately back of our huts in the ravine wild animals prowled at night. Although there were plenty of lions in the vicinity, since we heard them almost every night, they did not visit that ravine while we were there.

Next Slide: Our work required a laboratory and we had asked our English personnel to provide one. This is the result. You will notice the tank holds our water supply. Every morning the boys would go to a rhino hole some quarter of a mile distant, fill their pails and carry them back to the tank. I think this is about the only laboratory in this part of Africa that boasted of running water. Small animals were dissected here while the larger ones were taken care of in the field.

Next Slide: I mentioned Mr. Cooper, the young English zoologist, a while ago. We asked him to construct a leopard trap and this is the result. You will note he is surveying his handiwork. I should like to say a word with reference to this chap. The boys called him bwana dodo—which means Mr. Insect. We called him that

because he was forever after insects. He seemed to know every scientific name and jotted down such information in his notebook. However, here and there in his book he had recipes for bread and various kinds of cake. Mrs. Crile asked him shortly before Christmas to bake a cake and he proved himself quite an artist at it, but to show you how far a scientific attitude may carry one even in cake baking, I found him one day in his hut mixing up batter and taking a small portion of it on a slide for microscopic examination. I asked him why he did this and he replied that he wanted to be sure that he had a homogeneous mixture.

Next Slide: The country around our camp was dotted with huge termite or white ant hills. The mud which is carried up by the ants is cemented together with their saliva. The natives make use of this mud in paving and making side walls of it for their huts. The saliva in the mud gives it better staying qualities than ordinary mud.

Next Slide: We had some interesting neighbors some three or four hours' march from our camp. They are known as Mbulus. Some of these people seem to have a mixture of negro and Nilotic blood. They are very gentle people and very well behaved. A number of their boys worked for us at camp and made very good workmen. An interesting thing about these boys was that if you hired two of them you usually had the services of two or three more, for the boys who worked called in their friends and they would come around to see what we were doing and usually ended up by helping their companions. They liked to adorn themselves. One of their favorite adornments was made by cutting up entire inner tubes into garter-like strips, slipping these around the legs or over their heads and around their necks.

Next Slide: We asked them to stage one of their dances for us. One evening some forty or fifty men and girls appeared and they gave this dance for us. So far as I can see the dancing consisted mainly of jumping up and down to the monotonous repetition of certain words. The men and women were segregated in most of these dances even though they formed a common circle. I asked Captain Hewlett what they were singing about and he said the women were accusing the men of being hyenas. They claimed that they ran into the forest to see what they might destroy or what they might find in the way of diversion. The men replied, "It isn't so; it isn't so; we are the best of husbands; we are the best of men." This has a curious American twang to it.

Next Slide: Mr. Fuller of the Cleveland Museum of Natural History took many of our pictures. This is a picture of a buffalo herd which he secured early one morning. These are difficult beasts to photograph at best; in fact it is easier to shoot them than to photograph them. In the daytime they hide in the dense forest or dense swamp and at night time they feed on the grassy plain below the escarpment wall. This picture was taken just as they finished their night feeding, preparatory to their migration into the deep forest for the day.

Next Slide: This is a picture taken by Hewlett of Moshi showing another herd of buffalo. The bull standing at attention in the foreground weighs nearly a ton and can travel with remarkable speed.

Next Slide: The buffalo is considered by many as the most dangerous of the African game animals. I believe this is due to the fact that if they are wounded or in some cases

if they know they are hunted, they work back into the denser forest and try to lead the hunter astray and attack him from the rear. The horns, as you can see, can do an enormous amount of damage. He knocks a man down with them and kneads him with his knees. This animal is capable of releasing a tremendous amount of energy, yet one which we would call lazy when seen under ordinary conditions, habitually slow, yet one that can put on a strenuous spurt of speed. This animal weighed approximately 1,900 pounds. The horn spread was nearly fifty inches. We did not go out for records or trophies or heads but it was interesting to observe the horn spread in this group since all of them approached record size.

Next Slide: The rhino is one of the most peculiar of the African animals, I believe. I rather think that his peculiarity is due to the fact that he depends upon two senses, on the ear and on the nostril; that is, on the olfactory sense to gain his impression of the outside world rather than on the eye. The eye is very small. His theory of attack seems to be that it is better to charge twice in vain than to miss a good charge. Whenever we were out in the forest we were careful of the rhino. We were afraid of him—at least I was—because we were permitted to shoot only one on our game license and only in the event of real emergency could we shoot another. The game commissioner thought that nothing less than a direct frontal attack was an emergency. The rhino gives himself away by a loud business-like snort which tends to make your back hair stand up, but that does serve as a very effective warning. Usually, if you do not move he will hesitate a few moments and then go off at a tangent. I did read of two cases in Tanganyika where rhinos attacked a car and a truck and in the one case killed a woman passenger. They weigh approximately 3,000 pounds and travel thirty miles an hour, so you see the possibilities of tremendous damage.

Next Slide: Mr. Hewlett is pictured here. As I mentioned before, he was our guide. He is an ex-army captain, a fine gentleman and a great hunter. We felt absolutely safe and secure with him. His business is to take the hunter in the vicinity of the game, trail the game for him and when the hunter gets into trouble, it is up to Hewlett to get him out and bring him safely home.

Next Slide: One of the most beautiful of the African animals is the

Head of young Thompson gazelle

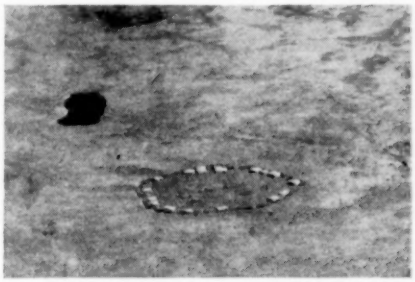
little Thomson gazelle. This one captured on the plain one morning had become separated from its mother and we chased it in our truck. It was necessary to travel forty miles an hour and it took us almost forty-five minutes to catch it. It has terrific speed. The eye makes up about one one-hundred-fiftieth part of the body as compared to the eye of the rhino, which runs about one thirty-thousandth.

Next Slide: An immense hippo was one of our later acquisitions. We nearly lost the thyroids because they lie so far down in the neck. Incident-

ally, this animal gave Captain Hewlett and me our closest call so far as real danger was concerned and that wasn't due to the fact that the beast was charging us, the beast was simply running away from the boys who were chasing it and trying to urge it out of the swamp, and since we were directly in its path it nearly overran us.

Next Slide: We took out time to visit the Ngorongoro crater during our African sojourn. This is considered the largest crater in the world, eleven miles in diameter. Until eleven in the morning, dense clouds cover the base of the crater. The next picture will show the bowl of the crater. As I just said, the crater is some eleven miles across and in the bowl of the crater you find immense herds of wild game. The British Colonial government has set aside the whole area as a game reserve and you are not permitted to do any shooting or take any photographs in the crater on the theory that if you go down to take pictures, you would undoubtedly take a gun along and you might get into troubie and have to shoot your way out. The lion, zebra, hyena and buffalo have a fair share of what they can secure for themselves in that great reserve, for the herbivorous plains animals abound.

Next Slide: We looked into the bowl of the crater some two thousand feet down and tried to make out what these structures were. They looked like huge stones. I thought at first glance that they were boulders and that they might have some religious significance because of their arrangement. I learned that they were the huts of a Masai tribe. The huts are built in a circle and are protected with thorn bush enclosure. At night the cattle are driven into this enclosure and the huts are sealed closely until morning when the boys go out with the cattle. The thorn bush serves to keep out the lions.



LOOKING DOWN INTO NGORONGARO CRATER 2,000 FEET; MASAI VILLAGE NEAR THE TREE

Next Slide: This is a Masai warrior in full regalia. The Masai are curious people in many respects, more intelligent than many of the true blacks in Eastern Africa. They migrated from the headwaters of the Nile in times past, and have spread over the vast grassy plain of Central Africa. The cattle represent wealth to them, and they naturally hate to part with their wealth. They seem to be the only people who have solved the problem of eating their cake and having it, too. In times past they discovered that they could bleed cattle by piercing the jugular vein, drawing a small amount of blood and sealing the wound thereafter without injury to the animal. In addition to that, they milk the cows, mix the blood and milk, and on this diet they seem to thrive. In this way their herds are not diminished.

Next Slide: These people go in for ornamentation in a big way. They love armlets and anklets. Native workmen are skilled in applying the armlets and the native women particularly seem to love going to market with perhaps three feet of brass wire coiled around their arms or ankles.

Next Slide: Most African natives

do not work with leather. Generally, they go naked or wear a bit of cloth. The Masai, however, are acquainted with the use of leather and know how to tan and prepare it.

Next Slide: Here is a native hut, a Masai hut at close range. The rifle seen on the shoulder of the native indicates that he must be a gunbearer, since the natives generally are not permitted to use firearms. This is a typical hut. At night it is sealed. The hut is built of mud and cow dung on thatched framework.

Next Slide: One evening we secured a giraffe at sun down and worked on him all night. Mrs. Crile, Captain Hewlett and Mr. Fuller went out to see the sun set. Instead they saw a huge giraffe near the roadway and we had a wonderful time working out the detail of that animal's anatomy. Skinning it was a problem. Contrary to the general notion, the giraffe has a large head. I always had an idea the giraffe had a small head. As a matter of fact, the head was over two and a half feet long. One of the eyes was almost closed with parasites. That was the usual condition found on these plains—animals were covered with parasites and the minute the animal was brought down, the ticks migrated from the animals to our own bodies and gave the boys some real exercise pulling ticks from our bodies.

Next Slide: You know, no expedition is complete without lions. Captain Hewlett and I spent several nights on tree platforms trying to induce lions to come to our various kills. They ignored us and would have nothing to do with the nice meal which we set out for them. After the third attempt of this kind, one Sunday morning Captain Hewlett and I decided to follow out along the forest margin to see if we couldn't bring back something. We hated to disappoint the camp and return empty handed so when the sun rose after our third night out we took up the march at sunrise, travelling for perhaps a mile or a mile and a half from the thorn bush enclosure where we had been hidden during the night, and we came upon a large zebra herd doing a bit of last-minute grazing before retiring to the forest. We found these two huge beasts just as they were engaged in stalking the zebra herd. Mr. Hewlett asked me to take the one on the left, adding, "Quiring, I'll secure the one on the right." He had a lot more confidence than I had. He brought his animal down with the first shot. I wasn't so fortunate and

TWO LIONS SECURED BY HEWLETT AND QUIRING. SEATED BETWEEN LIONS, MRS. CRILE; STANDING, FROM LEFT TO RIGHT, MR. FULLER, GUIDE, DR. QUIRING, CAPTAIN HEWLETT AND GEO. W. CRILE

had to use four or five shots. The one weighed 410 pounds; the other 430. The curious thing was that the adrenals of these fellows compared with the adrenals of the zoo animals show that they are definitely larger and that captivity undoutedly depresses the size of the glands.

Next Slide: The elephant, of course, is the greatest animal in Africa in point of size. Dr. Crile calls him the "emperor" of the animals. If the lion is the king, then this fellow surely merits the title of "emperor." The

African elephant is distinguished from the Indian elephant by its larger size. It has larger ears, larger tusks and is a larger animal all the way around. This animal is in a typical position to make an advance; it may be a "swank" charge or he may be starting on a true charge. When the forefoot goes up the hunter knows that action, and quick action, will follow.

Next Slide: One morning we were on the hunt for buffalo and after marching for two hours we rested in the forest for a while. We came upon this herd of elephant. There was a baby more or less hidden by the female. We were eager to secure a picture of the baby but the great bulk of the mamma hid the youngster. Curiously enough, the elephant does not have good eyesight. He, again, goes by sense of hearing and smell. We were within thirty-five yards of this group and they failed to see us. Finally, a small bull in the rear heard the clicking and whirring of the camera. He took a few steps toward us and then returned to the herd. He evidently sensed something was wrong but did not know what it was so he followed the herd into the forest instead of investigating more closely.

Next Slide: We spent ten days hunting one particular elephant. Captain Hewlett had noticed the spoor or trail of one particular beast, an animal which seemed to have been pushed from the herd; and because of the size of the tread, we resolved to get him. For ten days it was a battle of wits and strategy between Captain Hewlett, Dr. Crile and the animal. Finally, by using strategy instead of following his trail through the forest, Hewlett came upon the beast and he was brought down by Dr. Crile. The beast advanced along a ridge and slid down a vertical embankment and then hid in dense shade, evidently believing that he had outwitted his pursuers.

THE END OF THE ELEPHANT HUNT

Next Slide: The elephant weighed 14,640 pounds, a near-record so far as size is concerned. The tread was twenty-three inches in diameter. The circumference was sixty inches. The skin weighed over 2,000 pounds. The head from a point forward weighed over 1200 pounds. One of the limbs and shoulders weighed approximately 1500 pounds. The heart weighed fifty-seven pounds; the liver over two hundred and sixty pounds and the kidneys forty pounds. The brain weighed twelve and a half pounds. Everything about him was built on a gigantic scale. The mechanics of that dissection were tremendous.

Next Slide: The skin over the middle of the back was approximately two inches thick. After each short cut the knives had to be resharpened. After skinning the animal, we cut a window in the left side so that we could crawl in. Dr. Crile and I could stand up in that beast without our heads touching the outer wall.

Next Slide: The tusks of that animal weighed approximately forty-three pounds each. The tusks were approximately five and a half feet in length. Captain Hewlett told us an interesting story in that connection. While on elephant reduction work for

the government he shot an animal one evening and failed to bring him down. He began to trail him the next morning. He had great difficulty in trailing this elephant because the spoor seemed to be different from any he had ever followed. The elephant seemed to be backing up and dragging one of the tusks. Toward night of the second day Hewlett found him, still backing away and dragging his tusk. He put him out of his misery and found that his first shot had penetrated the base of the tusk and evidently given him a terrific toothache.

Next Slide: This gives you some conception of the large grassy plain, known as Serengeti, which is now an animal reserve.

Next Slide: These are wild storks. European storks come here for the winter and feed upon grasshoppers. In the spring they return to their European home.

Next Slide: One night we secured this rare specimen of "spring hase" or jumping hare on the Althai plain. He is peculiar in that his front legs have lost their propelling power and the back legs have taken on the burden. He is not a close relative of the kangaroo, yet follows the latter's method of locomotion.

Next Slide: The hyena is classed as vermin by the government and rightly so. It specializes on the weak and injured, and on female plains animals about to drop their young, and hence every hand is turned against him.

Next Slide: We have here a herd of wildebeest on the run. In the background you can see two or three zebras ready to start off. This is typical of the country. There seems to be no end of game life in Africa. We passed from the Tanganyika country to the head waters of the Nile, where Mr. Fuller and I hoped to obtain a pair of chimpanzee. From the headwaters we travelled down the Nile by boat to Alexandria.

Next Slide: We came upon this little village priest conducting a Roman Catholic service early one Sunday. The commissioner who was with us asked for two or three boys to help with the guns and duffle. Since the natives were being molested by elephants in this particular district, they had asked for the help of the magistrate, and the priest called on this parishioner to help us. The fellow did not care to go, since, according to him, he was very much interested in religion. This is the boy who wanted to attend the service. You can understand why he preferred religion since he had to carry approximately forty-five pounds of duffle for twelve miles; I will say this for him — he didn't murmur once and he didn't drop that load.

Next Slide: We secured a chimpanzee and a female at the border of the Belgian Congo at the headwaters of the Nile. It took us almost two weeks to secure these animals. They are not rare but they are very wary and highly intelligent. The natives call them "little brothers" and you feel like a murderer when you bring down one of them.

Next Slide: This is a typical scene along the Nile. These are Nuer huts. Life moves on very peacefully. Close to the waters of the Nile the people are fishermen; in the nearby plains they are herdsmen; and back on higher ground you may find a few tilling the soil.

Next Slide: Here is another peaceful scene along the river. These boys are fishermen. They catch their fish with spears. Occasionally, you find one with a handmade net. The people are rather friendly. They have had little contact with white men and are unspoiled. Nothing seems to wor-

ry them to any extent. After all, it isn't a bad way of life if you like that kind of an existence.

Next Slide: Here is a Nuer boy from near the great Suud swamp in the heart of Africa. The Nuers are partly Nilotic, partly negro. They bleach their hair and in some cases they even bleach their bodies. Urine is employed for this purpose.

Next Slide: This is a typical native market scene. These natives are not at all concerned about their appearance. A few leaves make up their entire dress.

Next Slide: Returning for a moment to Tanganyika, you will recall that I mentioned the Rift Wall. This is typical of that Great Wall. You find immense boulders of fairly recent origin displaced within the last hundred thousand years, and in the crevices you find pools of various sizes. Families of baboons come to the water hole to play and chatter. The baboon is a strict disciplinarian. He keeps an eagle eye on his family and if anything displeases him he has no hesitancy in slapping down his entire family.

There are as many Africas as there are travellers to the land. You have seen here a few pictures of a land that is teeming with surprises, and I have tried to give you a few impressions of a land too great to lend itself to casual description.

THE ANESTHESIA EXPLOSION HAZARD

VICTOR B. PHILLIPS*

Consulting Engineer to the University Hospitals, Cleveland

There is not the time available to cover at all comprehensively the subject matter of this paper. It will only be possible to emphasize certain high points, and then perhaps answer such specific questions and problems as you may have.

In the April, 1936, issue of Modern Hospital, I discussed rather fully the underlying theory of anesthesia explosions and safeguards, and in the May, 1936 issue, presented "A Proposed Code of Safeguards against the Anesthesia Explosion Hazard." May I suggest reference to these articles regarding many quite important aspects of the problem which cannot be dealt with here today.

The National Board of Fire Underwriters published a code of Safeguards in 1929. So far as I know this code is still the only official or semi-official code in existence. Since 1929, the importance of this whole subject has been more widely recognized, and in consequence much further study has been devoted to the subject. Without intending in any way to reflect upon this earlier work of the fire underwriters, I believe it in order to state here that in certain important respects this earlier Code does not conform to present day ideas. The 1929 Code calls for grounding of equipment as a protective measure. Today it is the considered judgment of many persons who have studied the subject at length that grounding in-

* Delivered before the annual convention of The National Association of Nurse Anesthetists, Cleveland, Ohio, October 1, 1936.

troduces hazards which are much more serious than the hazard which grounding aims to correct and which it may correct only very inadequately. This is most definitely my own conclusion.

Although statistics as to the frequency and seriousness of anesthetic explosions are not available, we know that there have been a great many such explosions and that the danger is a very real one and must be so recognized by every one connected with surgery or the handling of anesthetics. It is true that this particular hazard does not, perhaps, loom large compared with the other hazards of surgery, but this hazard is controllable. An anesthetic explosion cannot be condoned.

There seem to be quite a good many people who have a feeling of security because, through long years of experience, they have never had an explosion or at least not one with serious consequences. We might say, equally well, that modern traffic offers no hazard because none of us here have been killed by an automobile.

If we are to fully and adequately safeguard our hospitals against this explosion hazard, it is absolutely necessary that surgical personnel have a full understanding of the subject and of the principles involved and that they exercise ceaseless vigilance. Nothing in the way of construction or equipment will eliminate the necessity for such knowledge and such vigilance. This knowledge must embrace fundamentals because it is unlikely that any code of procedure can be written to take into account every conceivable combination of dangerous factors. However efficient the hospital maintenance department may be in keeping the equipment in first-class and safe condition, it is important none the less that every one connected with surgery be constantly on the lookout for wear and defects in equipment, especially electrical equipment, which may develop between inspections by the maintenance department.

There is no need to enumerate the characteristics of the various anesthetics except, for emphasis, to reiterate that all of the commoner anesthetics, with the exception of chloroform and nitrous oxide, are highly inflammable and in the mixtures encountered in anesthesia, are highly explosive.

The opinion has been current that ethylene is more dangerous than the ether-oxygen-nitrous oxide combination. This is not true. Ethylene does diffuse more readily than ether, and for this reason it is wise to exercise certain specific precautions. On the other hand, the ether-oxygen combination being considerably heavier than air, does not diffuse as readily to non-explosive concentrations.

It has been thought by some people that the presence of the small quantities of carbon dioxide, either generated by the patient or administered as a part of anesthesia, provide something of a safeguard. This is not true. Such concentrations are much too small to be a factor in smothering combustion. Carbon dioxide is perhaps the best single means of extinguishing fires of all kinds, but to be effective it must be in very high concentrations. Its use as a safeguard will be discussed further on.

It is of course superfluous to recite to you the chemistry of combustion, with which all of you are quite familiar. None the less, we may well review the elements involved.

An explosion results from the combination of (1) inflammable gas, vapor or other substance; (2) oxygen (either pure or in the air), or a gas

or other substance which provides oxygen (such as nitrous oxide); and (3) a source of ignition. These factors immediately suggest the fundamentals in all precautionary procedure, namely: (a) handling and using inflammable anesthetics in minimum quantities; (b) minimizing escape into the room; (c) eliminating so far as practicable all possible sources of ignition in the presence of inflammable anesthetics and above all, within the anesthesia equipment itself.

Quite fortunately the development of the modern anesthesia machine with the soda-lime filter and improved control of the flow of gases has gone a very long way toward reducing the explosion hazard. The modern machine has reduced the quantity of anesthetic used, and by making possible a much greater use of re-breathing, has greatly cut down escape into the operating room of explosive mixtures. Therefore the modern technique complies with the first of the two fundamentals of precautionary procedure enumerated above. This brings us to the third fundamental, namely, the elimination of all possible sources of ignition.

Sources of ignition include:

1. Any electric spark or arc either from static electricity or from the regular electric circuits.
2. Open flames.
3. All objects heated to and even somewhat below visible incandescence, such as cauteries, lighted cigarettes and the like.
4. Spontaneous combustion.

This latter is more apt to occur under considerable pressures. For example, oil or grease in the valves or lines containing oxygen under pressure will ignite spontaneously. Likewise, there have been explosions resulting from the admitting of ethylene into oxygen piping or vice versa.

Of the above sources of ignition, electric sparks call for more discussion, because they are the least understood by hospital personnel.

Static electricity is the most insidious and therefore probably the most dangerous cause of explosions, both inside the anesthesia machine and throughout operating rooms and other places where anesthetics are used or stored.

Static is created by friction, and although it varies in amount as between different combinations of materials, we should assume, for purposes of safety, that all combinations of materials are potentially hazardous. Static charges which are developed on nonconducting surfaces such as rubber are much more serious than those on conducting surfaces, for the reason that they remain closely localized. On a conducting surface, such a charge will spread or perhaps leak off. When even a very small static charge is closely localized, as it may be on a rubber breathing bag, a very high electrical potential may result. The same small charge spread throughout the frame of an anesthesia machine will produce an electrical potential which may be almost negligible.

In general, the presence of moisture increases electrical conductivity and consequently results in the spreading or leaking off of static charges.

Static is most likely to occur in cold weather, when buildings are heated, because at such times the relative humidity of the inside air is very greatly reduced which in turn reduces the moisture on the various surfaces.

The presence of adequate relative humidity in the surrounding area and particularly within the anesthesia machine, is undoubtedly the greatest

single safeguard against static and is really the only comprehensive safeguard. For most combinations of materials a relative humidity of about 60 per cent in the air or gases is sufficient to effectively spread and dissipate static, but it must be borne in mind that certain combinations of materials, such as hard rubber and wool, will retain static charges with relative humidities as high as 85 per cent or more. It is for this reason, regardless of whatever other precautions are being taken, that wool and silk should be prohibited in operating and anesthesia rooms. (This does not apply particularly to underclothing because the close contact with the moist skin probably minimizes the collection of static, although this is not necessarily or always true.)

The use of metallic conductors in intimate contact with nonconducting surfaces will likewise provide means of dissipating static. The difficult problem, however, is to achieve this result. If even a small area of breathing bag or tube is not in contact with a wire or metal mesh or chain, then there may result even greater differences in static potential than would have existed without such a conductor. This is particularly true if the conductor be grounded.

Perhaps second only to static electricity as a dangerous source of ignition is all of the electric wiring, switches, outlets, and the multiplicity of electrical appliances so extensively used in operating rooms. A list of such equipment is too long to include in this brief discussion. The problem of these electrical circuits and equipment is a more definite and tangible one than the problem of static. There are various makes of vapor-proof switches, plugs and receptacles, such that sparks created by making and breaking contacts are completely shielded from the explosive mixtures. Light bulbs can be enclosed and guarded.

Cords and terminals of portable equipment or which are not mechanically protected by conduit, armor or otherwise are a continual source of danger because of wear and breakage. Frequent inspection together with good maintenance will control this hazard, but it is important that all surgical personnel be constantly on the lookout for defects in equipment and wiring which may develop between regular inspections.

Electric cauteries are triply hazardous. First, the heated element is often hot enough to ignite the anesthetic mixtures. Second, the rheostat or transformer for adjustment of temperature is likely to spark. Third, the cord and terminals through frequent usage are likely to break or become detached, causing an arc or sparking. It is generally recommended that the cautery, as also diathermy and fulguration units, X-ray and fluoroscope, and all similar spark-producing equipment, not be used in the presence of inflammable anesthetics. This is not always practicable. It has seemed to me that if the use of an inflammable anesthetic in the presence of such dangerous source of ignition cannot be avoided, then with certain precautions and limitations the operation may be made reasonably safe.

First, however, it must be emphatically stated that under no circumstances can any cautery or spark-producing equipment be used around the head of the patient or in the pleural cavity, when the patient has been anesthetized with any inflammable anesthetic. To do so is criminal negligence.

With a carefully erected screen be-

tween the head of the patient and point of application of the cautery or spark-producing equipment, such as diathermy or fulguration unit, it would appear that the chance of an explosive concentration of the anesthetic reaching this source of ignition is not great, particularly if the room is well ventilated and the ventilation properly directed (from the head of the patient away from the operating table). However, it is doubtless much safer under such circumstances to avoid the use of ethylene or any other inflammable gas which diffuses readily. Ether does not readily diffuse, but on the other hand is heavier than air and with the protection of a proper and close-fitting screen it will tend to go down to the floor and not along the body of the patient to the cautery or other source of ignition.

When it is necessary to use a suction unit or bone saw or other motor-driven equipment, it is important that the motor be of a special enclosed type with bearings of proper design and nonsparking materials.

Another quite serious hazard is the deterioration or improper installation of concealed electric wiring in fixtures and equipment. The danger exists more particularly in portable equipment and especially in examination lights or other electrical equipment which is frequently washed or sterilized. Due to wear and tear or to water or to the heat of sterilization or to all of these causes, concealed insulation may break down and concealed connections may come loose or wires may even break from frequent flexing. Thus two things may happen. Bad sparking or arcing may occur, or the metal shell of the light may become electrically "live."

With the three-wire grounded neutral system so commonly used in light and convenience outlet circuits, the shell of the portable floor lamp or examination light or other piece of equipment may have a potential of 110 volts with reference to any grounded object. If such metal shell comes in contact with such grounded object (and it has been frequent practice to have all operating room equipment grounded) there results a short circuit flash or arc. If any person touches a grounded piece of equipment and at the same time touches a "live" shell or frame a bad shock is the result. Needless to say this is a dangerous source of ignition in the presence of inflammable anesthetics and furthermore may be quite dangerous from the standpoint of shock.

There is but one way to guard against the above hazard of concealed defective wiring and that is by no means a complete protection, namely, frequent and periodic tests of insulation resistance (with a megger) of practically all electrical equipment but especially portable floor lamps, examination lights and head lights. In the case of low voltage lights, rheostats preferably should not be used, but instead batteries or transformers in which the secondary is metallically entirely separate from the 110-volt primary. Furthermore, such transformers should be tightly enclosed, kept away from the floor and as far as possible from the patient's head.

The general grounding of operating room equipment serves only one purpose and that is the elimination of static. At the present time, grounding is a controversial question. Unless all equipment and all parts of equipment and all persons are fully and properly grounded, something which is most difficult of accomplishment, there will result marked differences of static potential which may in some instances be more dangerous than with no grounding. A person

who has picked up a static charge and who has not dissipated this charge before entering an operating room by touching a grounded plate or other grounded object, will usually produce more of a spark in the operating room upon touching a piece of grounded equipment than he would touching ungrounded equipment. Such a slip in technique can easily occur. There is too much of the human element involved to expect grounding to be complete.

The danger of short circuits with grounded objects due to defective or deteriorated insulation which is concealed, has been pointed out. The use of general grounding greatly increases this hazard, which involves both the danger of explosion and the danger of shock. The present evidence on the whole is against the grounding method, whether or not the operating room atmosphere is adequately humidified, but it must be made clear that, in the absence of proper room humidity, the lack of grounding leaves no protection against static developed outside of the anesthesia machine. It means acceptance of one hazard as being on the whole a lesser evil than the other hazards which grounding introduces.

This conclusion makes doubly important the other available protective measures for control of the static hazard; (1) adequate relative humidity in the operating room air; (2) sufficient well distributed and directed ventilation; (3) prohibition of wool blankets and clothing or any other materials especially productive of static; (4) above all, proper design and operation of anesthesia equipment to reduce to the minimum the danger of static inside this equipment, and escape of the explosive mixtures.

Without question the greatest single explosion hazard is the anesthesia machine, together with breathing tubes, bags and mask. The nonconducting parts, generally rubber, are the most serious offenders. Static charges, either developed in or on these parts or deposited by the moving gases, tend to remain concentrated in small areas due to the nonconducting material. If, however, means are provided for dissipating these localized charges so that they are spread at uniform potential through the entire machine, including the frame, the result is much less dangerous, even though the machine may not be grounded. The problem is to dissipate or spread these static charges.

To repeat what has already been said, there are two methods: (1) adequate humidity both inside and outside the machine; (2) metal mesh or other form of conductor in practically continuous contact with all nonconducting surfaces, both inside and outside and with the frame of machine. Single wires or chains unless very close together are not effective. The spiral wire commonly used in tubing is likely to break off at its point of attachment to the ferrule, thus providing a perfect spark gap at the end of a static collecting wire. At best, metal wires, mesh or chains are less effective than humidity because the latter permeates to all surfaces.

Adequate humidity inside the machine, breathing tubes and bags, is obtainable in three ways: (1) bubbling of gases or otherwise effecting intimate contact with water; (2) placing water in the breathing bags and moistening tubes and masks immediately prior to starting anesthesia; (3) using the rebreathing method to the fullest possible extent, thereby retaining the moisture and adding that given off by the patient.

The first two of the above sources of humidity will more than likely prove inadequate if rebreathing is not used most of the time. Bubbling gases through water does not necessarily cause the gases to become thoroughly moist. Unless rebreathing is used, water in breathing bags will dry up during an extended anesthesia, the moisture being quickly taken up by the continuous supply of new dry gases.

Accidents attributed to internal machine static have been so numerous that it is recommended that all three of the above means for maintaining humidity in the anesthesia machine and tubes may well be used.

At the beginning of this discussion, it was pointed out that two of the fundamentals in guarding against the anesthesia explosion hazard are the handling and use of inflammable anesthetics in the smallest possible quantities and the minimizing of the escape of the anesthetics into the room. It may well be repeated that the use of the rebreathing method to the maximum extent consistent with other requirements accomplishes these fundamental purposes, and at the same time serves to keep the inside passages of the anesthesia equipment moist and therefore reasonably free from dangerous static potential differences.

Even though the rebreathing method be used to the fullest extent, there still remains a distinct hazard at the end of the anesthesia period, when the mask is removed. The patient is then breathing out into the room an explosive mixture in considerable quantities and a similar mixture is likely to escape from the breathing tubes. Great care should be exercised at this time to permit no source of ignition anywhere near the patient. It should prove a worth-while safeguard to close the mask promptly with a moist rubber cap or remove mask from breathing tubes and cap the metal ferrule at the end of the breathing tubes, and as soon thereafter as possible to circulate carbon dioxide through the machine and tubes. Modern machines being equipped for carbon dioxide lend themselves to this procedure.

During the last few years, air conditioning has come into very general use. Much has been said about the value of air conditioning for hospitals. Therefore it may well be stated here that there is probably no place in the modern hospital where air conditioning is so fully justified as in operating rooms. I have laid stress upon the importance of relative humidity as a safeguard against the explosion hazard. An adequate and properly installed air conditioning system will provide the necessary relative humidity and at the same time controlled ventilation which serves to dilute and remove explosive mixtures of the anesthetic gases or vapors. Operating rooms are likely to be hot and stuffy because of the close proximity of sterilizers and the necessity of keeping doors and windows closed. An air conditioning system therefore will provide not only an important safeguard against explosions, but will, at the same time, add materially to the comfort and efficiency of the personnel.

If the installation of an air conditioning system be impossible for financial reasons, adequate relative humidity in operating rooms may be had at small cost by the installation of unit humidifiers, of which there are two main types, namely, those which evaporate water by a heating element, and those which throw into the atmosphere a finely atomized spray. The latter have the advantage of tending

slightly to cool the room, whereas the former will, of course, add heat, which is generally undesirable. Automatic control of any of these humidifiers may be accomplished by the installation of a humidistat, but if this is done, the installation should be such as to guard against the possibility of the sparking contact igniting explosive mixtures. (It would seem unlikely that there would be much danger of this happening if the humidistat be located high upon the wall and at least twelve feet or more from the patient.)

At the beginning of this paper I referred to a "Proposed Code of Safeguards" published in the May issue of Modern Hospital. This Code deals with types of equipment, building design and precautionary procedure. Needless to say, matters relating to types of equipment, installation of wiring, switches, fixtures and the like, or such protective measures as air conditioning or humidifiers are matters of concern primarily to the hospital administration and department heads. On the other hand, there are numerous precautionary measures which are a matter of daily routine procedure on the part of all surgical personnel.

In the University Hospitals of Cleveland, we have endeavored to periodically instruct all surgical personnel regarding the explosion hazard. This has been done by direct verbal instruction and also by posting in a number of conspicuous places important excerpts from the Code of Safeguards. Mimeographed copies of these excerpts are available here today for those of you who wish them (and are appended to this paper).

It may be of further interest to add that in the University Hospitals we follow the procedure of a complete inspection of every piece of electrical equipment used in surgery, once every three months. This inspection is made by our electrical engineer accompanied by the operating room supervisor. All such equipment as may have concealed electrical wiring is tested for condition of insulation for reasons which I have already pointed out.

UNIVERSITY HOSPITALS OF CLEVELAND

Excerpts from the Code of Safeguards against Anesthesia Explosion Hazard

1. *Cylinders, Ether Cans, Anesthesia Machines:*
   (a) Kept away from radiators, steam pipes, other sources of heat, possible contact with fire, *electrical equipment,* sparks, et cetera.
   (b) No flame permitted in operating room, anesthetizing rooms or adjacent corridors, where anesthetics are stored or used.
   (c) No lighted cigars, cigarettes or pipes permitted in such places.
2. *Prohibited in Operating Room or where Anesthetics are being administered:*
   (a) Wool blankets.
   (b) Silk or wool outer garments.
   (c) Ether never used for cleaning purposes.
3. *Anesthesia Equipment:*
   (a) Four ounces of water placed in breathing bag before starting anesthesia.
   (b) Breathing tubes and mask flushed with water before starting anesthesia.
   (c) Anesthesia machine flushed immediately with carbon dioxide when anesthetic is discontinued.

(d) No oil or grease used on anesthesia machine, or on oxygen valves or lines.

4. *Rooms not equipped with vapor proof electric switches:*
   (a) No switches operated, plugs inserted or pulled out in presence of anesthesia machine or for ten minutes after its removal from room.

5. *With use of such apparatus as Bovie Unit, Fulguration Machine, Nerve Finder, Bone Saw, X-ray, Motor Driven Apparatus, or in Fluroscopic Room, following technique permissible:*
   (a) Ether throughout (gas machine removed from room).
   (b) Gas-oxygen throughout, with no ether having been given or in the machine.
   (c) Gas-oxygen-ether, to induce anesthesia.
   When electric apparatus is being used, gas machine removed from room and continue with:
   (a) Drop ether.
   (b) Ether, through machine, such as Connell.
   (NOTE:—There must be an interval of ten minutes between the discontinuance of gas-oxygen-ether, and use of above electric apparatus.)

6. *Cauteries and spark producing equipment shall never be used in mouth, around head, or pleural cavity, excepting the anesthetic be a non-inflammable type.*

7. *Transporting machines to dispensary, dental clinic, et cetera:*
   (a) No ether in machine—to be carried in can separately if needed.
   (b) No ether in machine in Dental Clinic unless absolutely necessary.

8. *Anesthetics administered in patient's rooms:*
   (a) No ether to be used, or carried in machine.
   If ether is necessary, patient to be brought to surgery.

9. *Report immediately defective electrical equipment, cords, terminals, et cetera.*

Surgical personnel are required to be familiar with ENTIRE CODE.

EVIPAL

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In 1932 Traub and Krapp produced a drug which is known in this country as evipal and in foreign countries as evipan. For a short duration anesthetic they felt it would have distinct advantages over the anesthetics already in common use for that purpose. The advantages briefly stated are as follows:

(1) No complicated apparatus
(2) No waiting period for onset of anesthesia
(3) General narcosis, eliminating fear, excitement and restlessness
(4) Immediate post-anesthetic recovery period.

Weese of Germany used it pharma-

* Read at the fourth annual meeting of the National Association of Nurse Anesthetists. Cleveland, Ohio. October 1st. 1936.

cologically in 1932 and later demonstrated its use clinically.

Evipal, or evipan, is a sodium salt of N-methycyclohexnylmethyl-barbituric acid. It is a white, crystalline, tasteless powder. It is readily dissolved in water, but the solution is not stable and only fresh solutions should be used. Prepared solutions may be used over a period of two to three hours if not exposed to air. A precipitate will form if the solution comes in contact with carbon dioxide.

Evipal is primarily indicated for minor work of short duration (10 to 20 minutes). If used in dental cases the patient should be in the dorsal recumbent position, because the upright position may bring about an alarming fall in blood pressure. It may be used in major work if given in broken doses over a period of one to one and a half hours. Its use is advocated by Lyle and Fenton in eye work, because evipal lessens intraocular tension, making it especially desirable in acute glaucomatous cases. Several cases have been cited where it has been used as an induction to a general anesthetic for mentally unstable patients. An English author uses 2.3 c.c. as a painless induction for spinal anesthesia.

It is contraindicated for the debilitated, cachetic, toxic or septic patients. It should not be administered to patients suffering from bronchiectasis, low blood pressure, peritonitis or ileus. Evipal is detoxicated in the liver, consequently it should not be given in any case where there is an existing impairment of that organ. It is also contraindicated if the patient has a respiratory obstruction, as intravenous barbiturates may produce a spasm of the larynx and cause mechanical interference.

Widenhorn says, "The excretion of evipal from the body is not brought about by an aeration from the lungs as in inhalation anesthesia, but by a chemical breakdown. The liver plays an important part in this detoxification. Experimentation upon hepatectomized animals and liver poisoned animals showed a retarded detoxification. The kidneys do not cause any destruction of the evipal." Weese found traces of unchanged evipal in post-operative urine.

There are two methods of administration—intravenous and rectal. The former method is the one most commonly used for minor operations and the least difficult to administer. The powder is available in ampules of one gram each, and immediately prior to the injection a 10 per cent aqueous solution is prepared. This is done by using a 10 c.c. Luer syringe with a suitable needle attached for venous puncture. Ten c.c. of sterile distilled water is drawn into the syringe and then injected into the ampule containing the evipal. The powder will dissolve quickly, and the solution must be clear. If a precipitate should form the solution must be discarded. A suitable vein at the elbow is ordinarily used. As soon as the vein is entered the patient should be instructed to count slowly. It has been our experience that the patient will count to at least fifteen, or at the most forty before becoming unconscious. Fifteen seconds should be taken for the injection of the first c.c., then 15 seconds for the next two to three c.c. This gives a total of three to four c.c. the first thirty seconds, at which time the patient should be unconscious and the jaw beginning to relax. The preparation of the operative field may then begin. The remainder of the solution should be given slowly, depending upon the patient's reaction to the drug, but it should not be injected at a slower rate than one c.c. in fifteen

seconds. If so, anesthesia may not ensue, as the drug is very quickly detoxicated in the liver. At the end of one minute the injection is stopped for from thirty to sixty seconds (to allow complete circulation of the blood to take place) with the needle left in the arm, and the remainder of the solution given in broken doses if necessary. Sixteen c.c. have been given in broken doses by Weese, and seventeen c.c. in broken doses have anesthetized a patient over a period of one hour and forty minutes. The consensus, however, is that never more than 10 c.c. should be given as a total dose.

From January 1st, 1936, to September 15th, 1936, evipal was administered intravenously 195 times in this clinic. This group included:

Amputation of toe	2
Incision and drainage of abscess	7
Cystoscopy	8
Dilation and curettage	150
Cauterization of cervix	15
Manipulation of shoulder	3
Application of plaster cast	1
Miscellaneous	9
Total	195

The clinical records of only 80 of this series were available for detailed study. Therefore the foregoing statements are based on conclusions drawn from these records.

In the series of cases studied by us the smallest dose that was administered was 6 c.c., the largest 10 c.c. The shortest duration of sleep was 8 minutes and the longest 25 minutes. The shortest duration of time for the injection was 1¼ minutes, the longest 2½ minutes. We have found that the injection that takes from 2 to 2½ minutes results in the longest sleep. For example, 10 c.c. injected in 2½ minutes gave 25 minutes sleep, whereas 10 c.c. injected in 1¼ minutes gave only 8 minutes sleep. It must of course be kept in mind that the injection time should not exceed 3 minutes because of the rapid detoxification of the drug in the liver.

Jarman and Abel advocate giving only 2 to 5 c.c. to dispensary cases for the incision and drainage of abscesses, dental work and other minor operative procedures. They allow their patients to go home immediately upon recovery, preferably accompanied by a friend or relative. We, however, have not administered it to any patient who was not hospitalized postoperatively.

Gwathmey recommends evipal for rectal administration as a pre-anesthetic medication, supplemented with nitrous oxide, ethylene or ether. The dosage is based on the patient's weight, 0.2 c.c. being given for every pound. The patient may have a soda bicarbonate enema two hours previously. One-quarter grain of morphine sulphate may be given hypodermically forty to sixty minutes prior to the administration of the evipal, or it may be dissolved in the solution. After the solution has been drawn into the syringe, the needle is replaced by an infant catheter, which is inserted about four inches into the rectum. The complete solution is injected rapidly, followed by 10 c.c. of water. The catheter is clamped and the patient is usually asleep within five minutes. No cases of rectal irritation from evipal soluble have been reported. Widenhorn states that 30 to 50 per cent should be subtracted from the dose in the case of fat, anemic, septic, feverish, cachetic or severely ill patients; and 10 to 20 per cent added in the case of thin but very resistent patients, especially in the age groups of 15 to 40 years.

Jarman, in determining the dosage

to be given intravenously, claims that the best and most reliable index is the patient's reaction to the first two to three c.c. He states that if the orbit becomes centrally fixed and the jaw relaxed with this dosage the operative procedure should be started. It has been our experience, however, that if the operation begins at this point the stimulation will cause the patient to react. We have found that at least 6 c.c. is necessary to produce the desired results. Weese advocates judging the dosage by the patient's weight, i.e., giving 0.06 c.c. per kilogram of body weight. The following statement has been made by Gwathmey: "When 25 milligrams per kilogram of body weight was given to cats it produced anesthesia, while 100 to 110 milligrams per kilogram was necessary to cause death, giving a therapeutic index of 4. This is a higher index than ether, conceded to be the safest inhalation anesthetic."

Children will tolerate a larger dose than adults, but the senile and debilitated do not have a high tolerance. Repeated doses to the same individual do not produce a tolerance for the drug. Three injections of 8 c.c. each were given to one man in our clinic for cystoscopy, the sleep lasting 15, 10 and 18 minutes respectively. A second case where repeated injections were administered was in the instance of a girl twenty years old, for vaginal plastic work. She was given on three different occasions 9, 9 and 7 c.c. respectively, and the sleep lasted 12, 20 and 10 minutes respectively. For the last operation the evipal was supplemented with nitrous oxide plus oxygen, for twenty minutes, because it was found necessary to do more extensive work than was first thought necessary.

In the series of cases in this clinic 81.5 per cent of the patients were given a premedication of $\frac{1}{6}$ grain of morphine sulphate and $\frac{1}{150}$ grain of atrophine sulphate. No premedication was given to 18.5 per cent. The duration or depth of narcosis was not lessened in those cases receiving no premedication. It is our opinion that premedication is necessary only to alleviate psychic fear. No barbiturates should be given either pre- or post-operatively, as their action in conjunction with the evipal might prove too depressing. Gwathmey states that if evipal is given rectally to be supplemented with ether, that $\frac{1}{24}$ to $\frac{1}{98}$ grains of dilaudide will cause less nausea and vomiting post-operatively.

Respiratory stimulants should always be available when evipal is administered. Carbon dioxide 10 per cent, oxygen 90 per cent; 5 c.c. of coramine, or $\frac{3}{20}$ grains of alpha lobelin intravenously, may be used for respiratory embarrassment. Adrenalin may be used for an alarming fall in blood pressure. Only one patient in our series, a colored girl with a history of lues and a duodenal ulcer, needed a respiratory stimulant and carbon dioxide was used. She was brought to the operating room for a dilation and curettage. Her condition remained satisfactory during the operation but at the completion the respirations became shallow. Carbon dioxide 10 per cent was given and the patient left the operating room with a blood pressure of 114/80, pulse 160, respirations 20. Shortly afterward, on the ward, the blood pressure fell to 74/40. Carbon dioxide 10 per cent, and adrenalin 1/1000, were administered and the patient made a satisfactory recovery.

During the administration of evipal, when the amount necessary to produce unconsciousness has been given, there is a marked change in

the respiration. We found an increased rate (from 2 to 14 points) in 45 per cent of the cases; a decrease of 2 to 6 points in 27.5 per cent, and no change in 27.5 per cent. However, in all the cases there was a very marked decrease in the volume, but the volume of exchange was always sufficient to maintain a good color.

We found a rise in the pulse rate of from 2 to 60 points in 47.5 per cent of the patients; a decrease of 2 to 20 points in 25 per cent, and no change in 27.5 per cent. The volume remained good except in one case.

The blood pressure fell 2 to 40 millimeters systolic, in 72.5 per cent, and in 47.5 per cent of the patients there was a fall of 2 to 22 millimeters in the diastolic. There was a systolic rise of 4 to 20 millimeters in 21.25 per cent, and a diastolic rise of 2 to 20 millimeters in 16.25 per cent. There was no change in the systolic pressure in 6.25 per cent and no change in the diastolic in 36.25 per cent. In 8.75 per cent the blood pressure fell to below 90/48 and failed to return to normal immediately postoperatively. However, in all cases except one the blood pressure returned to normal within an hour.

Evipal may cause tonic twitching of the extremities. We noted this phenomenon in four cases; in three patients it occurred during the operation and lasted only 30 to 45 seconds. In the fourth case it occurred postoperatively and lasted approximately two minutes.

One of the valuable features of evipal is the absence of post-operative complications. We found nausea in 12.5 per cent of the patients and vomiting in 11.25 per cent. It was not severe in any case and the patients were able to eat the next meal following the operation. Headache was complained of in 7.5 per cent, but in only one case was it severe. Dizziness, shortness of breath, numbness of extremities and muscular twitchings were complained of in 5 per cent. Restlessness occurred during the recovery period in 11.25 per cent, but when full consciousness returned the patients were quite comfortable.

From time to time the intravenous method of administering anesthetics has suffered waves of enthusiasm, but it has not remained popular, chiefly because of the drugs employed. However, evipal has been proven pharmacologically and clinically to be a safe and valuable intravenous anesthetic, although for the future usefulness of this drug it must be remembered that the patients to whom it is administered must be selected with care. The ideal anesthetic, which can be administered to every patient, has not yet been discovered.

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